

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-119420

(43)Date of publication of application : 12.05.1998

(51)Int.Cl.

B41M 5/00

B32B 27/00

D21H 27/00

(21)Application number : 08-282225

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(22)Date of filing : 24.10.1996

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(54) INK JET RECORDING PAPER

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain ink jet recording paper, excellent in ink absorbing property and provided with high concentration of picture, by a method wherein at least one layer of ink receiving layers is formed by applying and drying liquid, containing at least fine solid particles and a low boiling point organic solvent.

SOLUTION: The ink receiving layer of ink jet recording paper is constituted of inorganic or organic solid particles and air gaps formed between the particles. The air gaps are formed between fine solid particles by a method wherein coating liquid, containing fine solid particles, having a volume substantially equal to or more than that of hydrophilic binder and/or fine particle oil drops and hydrophilic binder, is applied on a bearer. In this case, a low boiling point organic solvent is added into the coating liquid whereby the forming of rough particles due to the agglomeration of fine solid particles is restrained when the air gaps are formed between fine solid particles and, therefore, not only a coating film, having high luster, can be obtained but also ink absorbing property is improved by increasing the capacity of air gaps.

LEGAL STATUS

[Date of request for examination] 12.09.2001

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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CLAIMS

[Claim(s)]

[Claim 1] The ink jet record form characterized by being the ink opening acceptance layer formed on a base material in the ink jet record form which comes to prepare at least one or more-layer ink acceptance layer by carrying out spreading desiccation of the liquid with which at least one layer of this ink acceptance layer contained the solid-state particle and the low-boiling point organic solvent at least.

[Claim 2] The ink jet record form according to claim 1 characterized by the voidage of the opening acceptance layer containing said solid-state particle being more than 100 capacity %.

[Claim 3] The ink jet record form according to claim 1 or 2 which contains a solid-state particle and a hydrophilic binder in at least one layer of said ink opening acceptance layers, and is characterized by the weight ratios to these one sort of hydrophilic binders of this solid-state particle being 10 or more and less than 200.

[Claim 4] The ink jet record form according to claim 1, 2, or 3 characterized by being this ink opening acceptance layer formed by said ink jet opening acceptance layer carrying out spreading desiccation of the liquid which has a solid-state particle and a hydrophilic binder at least, was made to carry out flocculation of this solid-state particle under hydrophilic binder existence, and was obtained.

[Claim 5] In the ink jet record form which comes to prepare at least one or more-layer ink opening acceptance layer on a base material The layer in the most distant location from this base material makes a hydrophilic binder a subject. An ink jet record form given in any 1 term of claims 1-4 characterized by having the ink acceptance layer which is an ink acceptance layer (it is described as a swelling layer below) which does not have an opening, does not swell between this swelling layer and this base material, and has an opening.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the ink jet record form which has improved especially ink absorptivity about the ink jet record form which records using water color ink.

[0002]

[Description of the Prior Art] although ink jet record makes the minute drop of ink fly by various working principles, and is made to adhere to ink jet record sheets, such as paper, and an image, an alphabetic character, etc. are recorded, a high speed, the low noise, and multiple-color-izing are comparatively easy — etc. — it has the advantage. About the blinding of a nozzle and the maintenance which had become a problem from the former by this method, from both sides of ink and equipment, amelioration progresses and it has spread through various fields, such as various printers, facsimile, and a computer terminal, quickly in current.

[0003] As an ink jet record form used by this ink jet recording method, also when a printing dot laps [that a color tone is brightly skillful and absorption of ink] early, the diffusion to the longitudinal direction of ink flowing out or not spreading and a printing dot is not large [the concentration of a printing dot is high, and] beyond the need, and it is required that the circumference should be smooth and should not fade etc.

[0004] Since it becomes nonuniformity, and the color of each other in the border area of a color which a drop causes a HAJIKI phenomenon on an ink jet record form, and is different spreads and it is easy to reduce image quality greatly in case the liquid ink drop of two or more colors laps and is recorded, when especially ink rate of absorption is slow, it is required to give ink absorptivity high as an ink jet record form.

[0005] In order to solve these problems, very many techniques are proposed from the former.

[0006] As the pigment in the clad layer indicated by the ink jet record form which carried out humidity of the coating for surface treatment to the low size stencil indicated by JP,52-53012,A, the ink jet record form which prepared the coated layer of ink absorptivity in the support surface indicated by JP,55-5830,A, and JP,56-157,A The ink jet record form containing non-colloid silica powder, the ink jet record form which used together the inorganic pigment indicated by JP,57-107878,A and the organic pigment, The ink jet record form which has two hole distribution peaks indicated by JP,58-110287,A, The ink jet record form which consists of a vertical two-layer porous layer indicated by JP,62-111782,A, The ink jet record form which has the infinite form crack indicated by JP,59-68292,A, 59-123696, 60-18383, etc., The ink jet record form which has the impalpable powder layer indicated by JP,61-135786,A, 61-148092, 62-149475, etc., JP,63-252779,A, JP,1-108083,A, 2-136279, The ink jet record form containing the pigment which has the specific physical-properties value indicated by 3-65376, 3-27976, etc., or a particle silica, JP,57-14091,A, 60-219083, 60-210984, 61-20797, 61-188183, JP,5-278324,A, 6-92011, 6-183134, 7-137431, The ink jet record form containing particle silicas, such as a colloid silica indicated by 7-276789 etc., And JP,2-276671,A, 3-67684, 3-215082, Many ink jet record forms containing the hydrated alumina particle indicated by 3-251488, 4-67986, 4-263983, 5-16517, etc. are known.

[0007] However, since many ink absorbing layers with many openings will have irregularity with micro interface with air and coat front face, the incident light to an ink absorbing layer is scattered

about or transparency is barred when an ink absorbing layer absorbs ink or it consists of only layers which have many openings for holding, it becomes or tends to be hard to come out opaquely lusterless.

[0008] Moreover, in order to form an opening, there is a fault out of which the smooth nature on the front face of a coat by own irregularity of a pigment or the irregularity of the secondary floc of a pigment falls, and gloss cannot come easily.

[0009] Furthermore, although it is the inclination which the thickness of an opening layer increases in order to increase an opening in order to raise ink absorption capacity, since light stops easily being able to reach the ink which permeated the opening, an image becomes whitish, and it has the fault of color repeatability and the depth of shade falling.

[0010] Therefore, although the increase of voidage and examination to which it carries out and thickness raises voidage with a thin opening layer of an opening layer are also performed, it has the dispersibility of a pigment, coating liquid viscosity lifting, and a problem with still more various cracks after spreading of an ink acceptance layer, and desiccation etc.

[0011] Therefore, it was difficult to obtain the high image of color repeatability or the depth of shade, maintaining high glossiness and transparency in an ink absorbing layer with many openings.

[0012]

[Problem(s) to be Solved by the Invention] This invention is made in view of the above-mentioned actual condition, the 1st object of this invention is obtaining the ink jet record form which is the outstanding ink absorptivity and high image concentration, the 2nd object has still higher gloss, and it is in obtaining an ink jet record form without minute crack generating.

[0013]

[Means for Solving the Problem] The above-mentioned object of this invention is attained by the following configurations.

[0014] 1. Ink jet record form characterized by being ink opening acceptance layer formed on base material in ink jet record form which comes to prepare at least one or more-layer ink acceptance layer by carrying out spreading desiccation of liquid with which at least one layer of this ink acceptance layer contained solid-state particle and low-boiling point organic solvent at least.

[0015] 2. Ink jet record form given in said 1 characterized by voidage of ink opening acceptance layer containing said solid-state particle being more than 100 capacity %.

[0016] 3. Said 1 which contains solid-state particle and hydrophilic binder in at least one layer of said ink opening acceptance layers, and is characterized by weight ratios to these one sort of hydrophilic binders of this solid-state particle being 10 or more and less than 200, or ink jet record form given in 2.

[0017] 4. Said 1 and 2 which are characterized by being ink opening acceptance layer formed by said ink opening acceptance layer carrying out spreading desiccation of liquid which has solid-state particle and hydrophilic binder at least, was made to carry out flocculation of this solid-state particle under hydrophilic binder existence, and was obtained, or ink jet record form given in 3.

[0018] 5. Ink-jet record form given in said any 1 term of 1-4 which layer in the most distant location from this base material makes hydrophilic binder subject, and is characterized by to have ink acceptance layer which is ink acceptance layer (it is described as swelling layer below) which does not have opening, and has opening between this swelling layer and this base material in ink-jet record form which comes to prepare at least one or more-layer ink acceptance layer on base material.

[0019] Hereafter, this invention is explained to a detail.

[0020] The ink opening acceptance layer (only henceforth an opening layer) which the ink jet record form of this invention has consists of the opening formed an inorganic or organic particle and between them.

[0021] The formation approach of a desirable opening is the following two sorts.

[0022] (1) the solid-state particle which has the volume more than equivalent weight (preferably 1.0 or more times) in general to a hydrophilic binder — and — or the approach of applying the coating liquid containing a particle oil droplet and a hydrophilic binder on a base material, and creating an opening between solid-state particles — (2) The approach mean particle diameter makes solid-state particle about 0.1 micrometers or less condense at the time of coating liquid

adjustment or coat formation, forms a secondary particle or the three-dimensional structure, and creates an opening, 20–200A, the magnitude of the above-mentioned opening is 40–100A still more preferably, and it is preferably desirable to set up so that it may become the conditions in which the magnitude of packing and the manufacture conditions at the time of coat formation also form such an opening.

[0023] The approach of creating without taking a complicated production process from a viewpoint referred to as that the approach of of the above (1) and (2) creates an ink jet record form by low cost on the other hand is desirable.

[0024] As for the above-mentioned opening layer of the ink jet record form of this invention, it is desirable to have the binder, in order to maintain the property as a coat.

[0025] Although various kinds of conventionally well-known binders can be used as this binder, the hydrophilic binder with which permeability higher than ink is acquired is used preferably. However, it is important for a hydrophilic binder to swell, to swell in the activity of a hydrophilic binder, at the time of the osmosis in early stages of ink, and not to take up an opening, and a hydrophilic binder with low bloating tendency is comparatively used preferably near a room temperature from this viewpoint. Especially a desirable hydrophilic binder is the polyvinyl alcohol or cation conversion polyvinyl alcohol of perfect or partial saponification, and is **.

[0026] one especially desirable also in polyvinyl alcohol — whenever [saponification] — 80 or more parts — or full saponification is carried out. Moreover, from a viewpoint which improves coat brittleness, 500–10000 are desirable especially desirable, and, as for average degree of polymerization, the thing of 1000–5000 is used.

[0027] Moreover, it is polyvinyl alcohol which has the 1–3rd class amino group which is indicated by JP,61–10483,A, for example, and the 4th class ammonium in the principal chain of the above-mentioned polyvinyl alcohol, or a side chain as cation conversion polyvinyl alcohol.

[0028] Moreover, although other hydrophilic binders can be made to contain in said opening layer, as for those hydrophilic binders, it is preferably desirable that it is 20 or less % of the weight in general to the above-mentioned polyvinyl alcohol or cation conversion polyvinyl alcohol.

[0029] When forming the opening layer of the ink jet record form of this invention, as for especially a capacity factor [as opposed to the hydrophilic binder of a solid-state particle the case of the above (1) or the opening creation by (2) which is a desirable mode], three or more are desirable, and it is desirable to carry out to four especially or more.

[0030] As for the capacity of the opening of the opening layer of the ink jet record form of this invention, it is desirable that they are two or more 20 ml/m per two 1m of ink jet record forms. When void volume is less than [20ml //m] two, although the absorptivity of the amount of low ink is good, ink overflows in the case of printing of the high amount of ink, image quality is reduced or problems, like drying [after printing] is late tend to produce it.

[0031] On the other hand, although especially the upper limit of void volume is not restricted, the desiccation thickness of an opening layer is two or less 40 ml/m in general from it being required in order that making it 50 micrometers or less in general may not worsen the physical characteristic of coats, such as a crack.

[0032] In the approach of the above (1), in order to attain two or more 20 ml/m void volume, it is desirable to carry out voidage of an opening layer more than 100 capacity %.

[0033] Void volume is the value which deducted the total amount of the capacity of solid content, such as a binder in an opening layer, and various kinds of bulking agents, from the desiccation thickness in an opening layer, and voidage shows the rate of the amount of openings to the capacity of these solid content here.

[0034] It is good to carry out voidage preferably more than 150 capacity %. Although the upper limit of voidage generally changes with the class of bulking agent, or the classes of binder, generally it is below 200 capacity % from the reinforcement as a coat, brittleness, etc.

[0035] Especially in order to carry out voidage to more than 100 capacity % preferably, the ratio of a solid-state particle and a hydrophilic binder is important, ten or more have a desirable weight ratio to the hydrophilic binder of this solid-state particle, and it is more desirable that carrying out to less than 200 carries out. This weight ratio becomes difficult [it / for void volume to obtain 100% or more less than by ten], and the brittleness of a coat deteriorates in the case of 200 or

more.

[0036] When there is an opening layer in the opening layer containing a solid-state particle, as a solid-state particle, a well-known solid-state particle inorganic [various kinds of] or organic can be conventionally used in an ink jet record form.

[0037] As an example of the non-subtlety particle used for the above-mentioned object, white inorganic pigments, such as precipitated calcium carbonate, whiting, a magnesium carbonate, a kaolin, clay, talc, a calcium sulfate, a barium sulfate, a titanium dioxide, a zinc oxide, zinc hydroxide, zinc sulfide, zinc carbonate, a hydrotalcite, aluminum silicate, the diatom earth, a calcium silicate, a magnesium silicate, synthetic amorphous silica, colloidal silica, an alumina, a colloidal alumina, pseudo-boehmite, an aluminum hydroxide, a lithopone, a zeolite, and a magnesium hydroxide, etc. can be mentioned.

[0038] Such a non-subtlety particle may be added in the condition of being used into a binder after homogeneity has distributed having also formed secondary floc with the primary particle, and having distributed in the binder.

[0039] On the other hand as an example of an organic particle, polystyrene, polyacrylic ester, polymethacrylic acid ester, polyacrylamides, polyethylene, polypropylene, a polyvinyl chloride, polyvinylidene chlorides or these copolymers, a urea-resin, or melamine resin is mentioned.

[0040] It is more desirable than the point of high concentration being attained in this invention, and a clear image being recorded, and being able to manufacture by low cost to use the solid-state particle chosen from a hydrated alumina particle, a silica particle, and a calcium carbonate as a solid-state particle.

[0041] The alumina or hydrated alumina preferably used for this invention is the porosity alumina whose sum of the pore volume in which a radius (minor axis) has 3–10nm is 0.2 – 2 ml/g, or its hydrated compound. The measurement means of pore volume can be measured with a well-known nitrogen adsorption process to an alumina or the desiccation solid content of hydrated alumina.

[0042] An alumina or hydrated alumina may be crystallinity, or may be amorphous, and a configuration can use the object of the configuration of arbitration, such as an infinite form particle, a spherical particle, and a needlelike particle.

[0043] The synthetic silica which could use various kinds of well-known silica system particles by the ink jet conventionally as a silica system particle preferably used for this invention, for example, was compounded by wet or the gaseous-phase method, colloidal silica, and the silica of the configuration of the porosity silica arbitration which a primary particle condenses and forms the secondary particle can be used. As such an example, for example, the synthetic amorphous silica indicated by JP,55-51583,A, 56-148583, etc., For example, the silica ultrafine particle compounded by the gaseous-phase method indicated by JP,60-204390,A, The synthetic infinite form silica containing the fluorine indicated by JP,60-222282,A, The synthetic infinite form silica in which surface treatment was carried out by the silane coupling agent indicated by JP,60-224580,A and 62-178384, For example, the spherical silica indicated by JP,62-183382,A and 63-104878, The synthetic silica particle whose Na₂O content indicated by JP,63-317381,A is 0.5 % of the weight or more, The specific surface area indicated by JP,1-115677,A The synthetic silica particle more than 100m²/g, The synthetic silica particle which was indicated by JP,62-286787,A and by which alumina surface treatment was carried out, The synthetic silica particle by which surface treatment was carried out by calcium, Mg, or Ba indicated by JP,1-259982,A, The colloidal silica oil absorption was indicated to be by a 180ml [/g] or more composition silica particle and JP,57-14091,A, The cationic colloidal silica indicated by JP,60-219084,A, JP,6-92011,A, 6-297830, and 7-81214, And the colloidal silica which connected in the shape of [which was indicated by JP,5-278324,A and 7-81214] a rosary, or branched can be mentioned.

[0044] However, in order to obtain high glossiness and high void volume, it is desirable to use the silica ultrafine particle whose mean particle diameter is 7–30nm. The reliance of this silica particle is also good by the object which cation denaturation could be carried out in the front face, and was processed by aluminum, calcium, Mg, Ba, etc.

[0045] As a calcium carbonate preferably used for the ink jet record form of this invention For example, JP,57-12486,A, 57-129778, 58-55283, The precipitated calcium carbonate which has specific surface area in the specification indicated by 61-20792, The needle pillar-shaped calcium

carbonate indicated by JP,63-57277,A **** JP,4-250091,A, The calcium-carbonate particle which the specific needlelike primary particle indicated by JP,3-251487,A condensed, and formed the secondary particle, the needle which has the specific oil absorption indicated by JP,4-250091,A and 4-260092 — a pillar-shaped prismatic crystal Argo night calcium carbonate, the spherical precipitated calcium carbonate indicated by JP,7-40648,A are mentioned.

[0046] In this case, since high glossiness and high void volume can be obtained, it is desirable that particle size uses calcium-carbonate particle about 0.1 micrometers or less, and it is desirable to use the calcium-carbonate particle especially whose mean particle diameter is 10-50nm.

[0047] It is desirable for a solid-state particle and a hydrophilic binder to carry out a strong interaction comparatively, and to form a flocculation object on the other hand, when performing opening formation by the above (2). Such a solid-state particle and a hydrophilic binder can be suitably chosen from from, while describing above, for example, they can mix those water solutions with a water distribution object, and can judge them comparatively easily from the viscosity lifting.

[0048] A desirable gestalt mixes the water solution [A] (usually 1 - 20 % of the weight) and solid-state particle dispersion liquid [B] (usually 1 - 30 % of the weight) of a hydrophilic binder, and can use that from which the viscosity of the obtained mixed liquor becomes at least 1.5 or more times with higher [A] or [B].

[0049] Especially a desirable thing is a polymer which has a hydroxyl group at least as a hydrophilic binder in this invention, and polyvinyl alcohol and especially cationic polyvinyl alcohol are desirable.

[0050] Moreover, as a solid-state particle, especially the particle silica and magnesium silicate whose mean particle diameter is 0.005-0.1 micrometers are desirable.

[0051] As for the low-boiling point organic solvent of this invention, what does not evaporate and remain at the time of spreading desiccation is desirable, and 130 degrees C or less of 100 degrees C or less of boiling points are an organic solvent 80 degrees C or less most preferably especially preferably. Moreover, 1% of the weight or more of a low-boiling point organic solvent has the desirable solubility to the water in a room temperature.

[0052] A methanol, ethanol, isopropanol, n-propanol, n-butanol, 2-methoxyethanol, an acetone, a methyl ethyl ketone, 2-hexanone, ethyl acetate, vinyl acetate, isopropyl acetate, n propyl acetate, n-butyl acetate, an ethyl formate, formic-acid propyl, ethyl butylate, butanoic acid vinyl, methyl butyrate, a methyl acrylate, a tetrahydrofuran, an acetonitrile, 1, 2-dimethoxyethane, isopropyl vinyl ether, 1,4-dioxane, etc. are mentioned as an example of a low-boiling point organic solvent. These may use two or more sorts together.

[0053] As for such a low-boiling point organic solvent, it is desirable to use one to 15% of the weight to a hydrophilic binder preferably.

[0054] Although various change of the concentration of this low-boiling point organic solvent is carried out at a class, concentration, etc. of the concentration of a solid-state particle, and a hydrophilic binder in case the coating liquid containing the above-mentioned low-boiling point organic solvent is prepared, generally the concentration in coating liquid is 0.5 - 10 % of the weight preferably 0.1 to 15% of the weight.

[0055] Moreover, as long as the addition stage of an organic solvent is before spreading, what kind of stage at the time of coating liquid preparation is sufficient as it, and it may specifically be the time of mixing with a hydrophilic binder solution or just before spreading, ****, or the stage to become at the time of distribution of a solid-state particle.

[0056] By adding the low-boiling point organic solvent of this invention in coating liquid, in the opening formation by the approach of the above (1), formation of the big and rough particle by condensation of a solid-state particle is controlled, while the paint film which has high gloss is obtained, void volume increases and ink absorptivity is improved.

[0057] Moreover, in the approach of the above (2), since the interaction of a solid-state particle and a hydrophilic binder is comparatively strong, generally it is easy to thicken coating liquid, and workability, spreading nature, and productivity tend to fall. In this case, by adding the low-boiling point organic solvent of this invention, coating liquid viscosity carries out adhesiveness-reducing, and workability, spreading nature, and productivity improve. Moreover, rapid thickening of coating liquid according to lowering of paint film temperature and evaporation of the organic solvent itself rapidly by evaporation of an organic solvent in after coating liquid desiccation can enable it to

spray a strong desiccation wind, and spreading speed can also be increased greatly.

[0058] Various kinds of additives can be made to contain if needed in the layer of the arbitration by the side of the ink opening acceptance layer of the ink jet record form of this invention.

[0059] For example, an ultraviolet ray absorbent given in JP,57-74193,A, 57-87988, and 62-261476, JP,57-74192,A, 57-87989, 60-72785, The fading inhibitor indicated by 61-146591, JP,1-95091,A, 3-13376, etc., An anion, a cation or the various surfactants of Nonion, JP,59-42993,A, The fluorescent brightener indicated by 59-52689, 62-280069, 61-242871, JP,4-219266,A, etc., Various well-known additives, such as lubricant, such as pH regulators, such as a sulfuric acid, a phosphoric acid, a citric acid, a sodium hydroxide, a potassium hydroxide, and potassium carbonate, a defoaming agent, and a diethylene glycol, antiseptics, a thickener, a hardening agent, an antistatic agent, and a mat agent, can also be made to contain.

[0060] An inorganic or organic hardening agent can be used as a hardening agent, for example, chromium alum, formaldehyde, a glyoxal, an epoxy system compound, a vinyl sulfone system compound, an acryloyl system compound, s-triazine system compound, N-methylol system compound, a carbodiimide system compound, ethylene imino *****, etc. can be used.

[0061] Although especially a limit does not have the amount of the spreading solid content by the side of the ink recording surface in the ink jet record form of this invention, 5 - 60 g/m² is desirable to an ink jet record form in general, and 10 - 40 g/m² is more desirable. In addition, from the field of prevention of the curl after record image formation, it is good to form as thinly as possible.

[0062] Into the configuration layer of the arbitration by the side of the ink recording surface of this invention, an alkali-metal weak acid salt the poly allylamine of publications, such as the poly cation polyelectrolyte of JP,56-84992,A, a basic latex polymer of JP,57-36692,A, JP,4-15744,B, JP,61-58788,A, and 62-174184, and given in JP,61-47290,A etc. can be used more than a kind as a deck-watertight-luminaire-ized agent of an image.

[0063] As a base material of an ink jet record form, a thing well-known as a record form for ink jets can be conventionally used suitably by this invention.

[0064] Also **** which mentions the film which consists of ingredients, such as polyester system resin, diacetate system resin, triacetate system resin, acrylic resin, polycarbonate system resin, polyvinyl chloride system resin, polyimide system resin, cellophane, and celluloid, a plate, a glass plate, etc. as a transparence base material, for example, and in this, the thing of a property which bears the radiant heat when being used as an OHP is desirable, and especially polyethylene terephthalate is desirable. As thickness of such a transparent base material, about 10-200 micrometers is desirable. It is desirable from an adhesive viewpoint of an ink opening acceptance layer, a back layer, and a base material to prepare a well-known under-coating layer in an ink opening acceptance layer [of a transparence base material] and back layer side.

[0065] Moreover, what carried out opacification processing of the sheet which consists of common paper, a synthetic paper, resin coat paper, cloth, timber, a metal, etc. as a base material used when there is no transparent need, for example, a plate, and the above-mentioned translucency base material with the well-known means can be mentioned. The so-called White pet which comes to add white pigments to the resin coat paper (the so-called RC paper) which has the polyolefin resin enveloping layer which added white pigments etc. at least to one side of a base paper as an opaque base material, and polyethylene terephthalate is desirable.

[0066] It is desirable to perform corona discharge treatment, undercoating processing, etc. to a base material in advance of spreading of an ink opening acceptance layer for the object, such as to enlarge bond strength of the above-mentioned base material and an ink opening acceptance layer. Furthermore, the record sheet of this invention does not necessarily need to be colorlessness, and may be a colored record sheet.

[0067] In photograph image quality, near and especially since the image of high quality is moreover obtained by low cost, as for a record image, it is desirable to use the paper base material which laminated both sides of a paper base material with polyethylene in the ink jet record form of this invention. The paper base material laminated with such polyethylene is explained below.

[0068] The stencil used for a paper base material uses wood pulp as the main raw material, and, in addition to wood pulp, paper making is carried out using synthetic fibers, such as synthetic pulps,

such as polypropylene, or nylon, and polyester, if needed. Although both LBKP, LBSP, NBKP, NBSP LDP and NDP LUKP and NUKP can be used as wood pulp, it is desirable to use more many [for a staple fiber] LBKP, NBSP(s), LBSP(s), and NDP(s) and LDP(s). However, it reaches LBSP or the ratio of LDP has 10 % of the weight or more and 70 desirable % of the weight or less.

[0069] The pulp of the above-mentioned pulp which chemical pulp with few impurities (sulfate pulp and sulfite pulp) was used preferably, and performed bleaching processing, and raised the whiteness degree is also useful.

[0070] In a stencil, flexible-sized agents, such as moisture hold-back agents, such as paper reinforcing agents, such as white pigments, such as sizing compounds, such as a higher fatty acid and an alkyl ketene dimer, a calcium carbonate, talc, and titanium oxide, starch, polyacrylamide, and polyvinyl alcohol, a fluorescent brightener, and polyethylene glycols, a dispersant, and the 4th class ammonium, etc. can be added suitably.

[0071] The freshness of the pulp used for paper making has desirable 200–500 cc by convention of CSF, and 30 thru/or 70% have the desirable sum of 24-mesh residue weight % and weight % for 42-mesh ** as which the fiber length after beating is specified to JIS-P -8207. In addition, as for weight % of the four-mesh residue, it is desirable that it is 20 or less % of the weight.

[0072] The basis weight of a stencil has 30 thru/or desirable 250g, and 50 thru/or especially its 200g are desirable. The thickness of a stencil has 40 thru/or desirable 250 micrometers.

[0073] After a paper-making phase or paper making, calender processing of the stencil can be carried out and it can also give the Takahira slippage. A stencil consistency has 0.7 thru/or common 1.2 g/m² (JIS-P -8118). Furthermore, stencil stiffness has 20 thru/or desirable 200g on the conditions specified to JIS-P -8143.

[0074] A surface sizing compound may be applied to a stencil front face, and the same sizing compound as the size which can be added among said stencil as a surface sizing compound can be used for it.

[0075] When measured by the hot water extraction method specified by JIS-P -8113, as for pH of a stencil, it is desirable that it is 5–9.

[0076] Although the polyethylene which covers a stencil front face and a rear face is mainly the polyethylene (LDPE) of a low consistency, and/or polyethylene (HDPE) of high density, a part of other LLDPE(s), polypropylene, etc. can be used for it.

[0077] As for especially the polyethylene layer by the side of an ink opening acceptance layer, what added the titanium oxide of a rutile or an anatase mold in polyethylene as widely performed by the photographic paper for photographs, and improved opacity and a whiteness degree is desirable. A titanium oxide content is 4 – 13 % of the weight preferably three to 20% of the weight in general to polyethylene.

[0078] polyethylene coat paper can also use the object in which a mat side which performs the so-called mold attachment processing and is acquired with the usual photographic printing paper, and the silky surface were formed, by this invention, in case melting push appearance also of also using as glossy paper is carried out and it coats polyethylene on a stencil front face.

[0079] After preparing an ink opening acceptance layer and a back layer, the amount of the polyethylene used of the front flesh side of a stencil is damp and range whose 20–40-micrometer and back layer side the polyethylene layer by the side of an ink absorbing layer is 10–30 micrometers in general, although it is chosen so that the curl by highly-humid-izing may be optimized.

[0080] Furthermore, as for the above-mentioned polyethylene coat paper base material, it is desirable to have the following properties.

[0081] A lengthwise direction by the reinforcement specified by JIS-P -8113 in hauling strength ** 2 thru/or 30kg, A lengthwise direction by the convention approach by ** tear on-the-strength: JIS-P -8116 with desirable longitudinal directions being 1 thru/or 20kg 10 thru/or 200g, A longitudinal direction on the conditions specified to 20 thru/or ** compressibility ≥ 103 kgf/cm² ** surface Beck smoothness: JIS-P-8119 with desirable 200g 20 seconds or more, Although 500 seconds or more are especially preferably desirable as a glossy surface, especially 90% or more is desirable 85% or more by the approach by ** opacity: JIS-P -8119 which may be less than [this] in the so-called mold attachment article.

[0082]

[Example] Although the example of this invention is given and explained below, this invention is not limited to these examples. In addition, in an example, especially, as long as there is no notice, oven-dry-weight % is shown "%."

[0083] The paper base material which covered 1100g of examples/, and stencil both sides of m2 with polyethylene (it is 7% of the weight of anatase mold titanium-dioxide content in the polyethylene layer by the side of 140 micrometers in thickness, and a recording surface.) The layer which applies to a recording surface side so that humid thickness may turn the following [coating liquid 1-1] to 188 micrometers in [having the layer which contains alkali treatment gelatin 1.2 g/m2 and a hardening agent as a back layer in the rear-face side of a recording surface], dries, and has an opening was painted on the base material, and the ink jet record form -1 was obtained.

[0084]

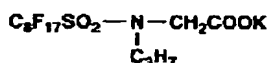
[Coating liquid 1-1]

Pure water 935ml Particle silica with a mean particle diameter of about 0.07 micrometers 67.5g
Polyvinyl alcohol of average degree of polymerization 3500 18g (whenever [saponification] 89%)
Ethyl acetate 38.2ml Surfactant -1 1.2g of void volume of this coat was 23 ml/m2.

[0085]

[Formula 1]

界面活性剤-1



[0086] Next, ink jet record form which changed spreading using [coating liquid 1-1] as follows in the ink jet record form -1 - 2-7 were created like the ink jet record form -1.

[0087] Ink jet record form - It is the same as the ink jet record form -1 except having changed the ethyl acetate of 2: [coating liquid 1-1] into pure water.

[0088] Ink jet record form - Three: [coating liquid 1-2]

Pure water 980ml Particle silica with a mean particle diameter of about 0.07 micrometers 48.2g
Polyvinyl alcohol of average degree of polymerization 3500 12.8g (whenever [saponification] 89%)
Surfactant -1 The layer which applies the 1.2g above-mentioned coating liquid so that humid thickness may turn to 125 micrometers, carries out spreading desiccation again with the above-mentioned coating liquid further after desiccation, and has an opening was painted on the base material.

[0089] It is the same as the ink jet record form -1 except having reduced the amount of the ethyl acetate of the coating liquid [coating liquid 1-1] of the ink jet record form-4 above to 18 ml/m2, and having increased the amount of pure water by 10.2ml.

[0090] Ink jet record form - It is the same as the ink jet record form -1 except having changed the ethyl acetate of 5: [coating liquid 1-1] into isopropanol.

[0091] Ink jet record form - It is the same as the ink jet record form -1 except having changed the ethyl acetate of 6: [coating liquid 1-1] into the acetone.

[0092] Ink jet record form - It is the same as the ink jet record form -1 except having changed the ethyl acetate of 7: [coating liquid 1-1] into the methyl ethyl ketone.

[0093] About each obtained ink jet record form, using ink jet printer MJ[by Seiko Epson, Inc.]-5100C, the assessment pattern was printed and the following items were evaluated.

[0094] (1) Ink absorption capacity : when 30% of the amount of the maximum ink of ** yellow, 60% of regurgitation of the amount of the maximum ink of each ink of cyanogen, and Magenta ink was made to breathe out at the time of 60% of regurgitation of the amount of the maximum ink of each ink of ** yellow and cyanogen, the condition of the overflow of the ink in each case was observed visually.

[0095] [The overflow of ink]

O x dried within about 10 seconds although it is overflowing slightly immediately after **:printing which does not overflow at all immediately after :printing : it takes a front face 10 seconds or more to overflow immediately after printing and to dry.

[0096] (2) ink absorptivity: — ** yellow and cyanogen — it becomes 30% of the amount of the maximum ink, respectively — as — Homogeneity was made to breathe out, it recorded, 20 red-reflex concentration of the solid section was measured using the microdensitometer (aperture =200micrometerphi), and the value broken by average reflection density in quest of the standard deviation of the variation in the concentration was calculated.

[0097] When ink absorptivity is good, the value of non-Lycium chinense becomes [nonuniformity] small at an image, but if ink absorptivity falls, this each other liquid ink drops will cause beading mutually in the record paper, it will become nonuniformity, and this value will increase.

[0098] (3) drying: — the single dot of black was printed in the single dot diameter (K) of (4) dot diameter:black ink and the yellow solid printing section which found time amount until it leaves a regular paper in piles and ink stops imprinting 60% printing section of yellow and a Magenta in a regular paper after after [printing] fixed time amount progress, and they were observed and asked for the diameter under the microscope (K/Y). It asked for the diameter as the average of the diameter when measuring the area of 20 dots, respectively and carrying out the circle conversion of this (unit: micrometer).

(5) Glossiness : gloss was measured for the printing side 60 degrees using the deflection glossmeter (VGS-1001DP) by Nippon Denshoku Industries Co., Ltd.

[0099] (6) The minute crack of a paint film : the crack of a paint film took the microphotography by one 50 times the scale factor of this about the cyanogen printing section, and evaluated it by viewing using this photograph.

[0100] a valuation basis has no generating of O; crack — x; which has generating of **:crack slightly — the crack printed the (7) printing concentration:black ink which is accepted considerably and which can be checked by looking even if it does not do xx:amplification of, and measured printing concentration with optical density.

[0101] The higher one of a numeric value shows that printing concentration is high.

[0102] The void volume of each ink jet record form etc. was as follows.

[0103]

[A table 1]

| インクジェット 記録用紙 | 湿润膜厚 (μ m) | 乾燥膜厚 (μ m) | 空隙容量 (ml/m ²) | 空隙率 (%) | 備考 |
|-----------------|--------------------|--------------------|------------------------------|------------|-----|
| 1 | 188 | 38.4 | 23 | 149 | 本発明 |
| 2 | 188 | 37(a) | 16 | 76 | 比較例 |
| 3 | 125×2 | 52 | 23 | 79 | 比較例 |
| 4 | 188 | 36.4 | 20 | 122 | 本発明 |
| 5 | 188 | 42 | 20.3 | 91 | 本発明 |
| 6 | 188 | 37.4 | 22.6 | 152 | 本発明 |
| 7 | 188 | 38.4 | 22.5 | 141 | 本発明 |

(a) ; 塗布表面の凹凸が激しく真の膜厚ではない

[0104]

[A table 2]

| 記録 用紙 | インク容量 | | インク 吸収性 | 乾燥性 (分) | ドット直径 | | 光沢度 (%) | 比割れ | 色濃度 | 備考 |
|----------|-------|---|------------|------------|-------|-----|------------|-----|------|-----|
| | ① | ② | | | K | K/Y | | | | |
| 1 | ○ | ○ | 0.06 | 2 | 82 | 109 | 84 | ○ | 1.39 | 本発明 |
| 2 | △ | × | 0.18 | 5 | 120 | 210 | 8 | × | 1.03 | 比較例 |
| 3 | ○ | ○ | 0.08 | 2 | 90 | 122 | 76 | ○ | 1.09 | 比較例 |
| 4 | ○ | ○ | 0.07 | 2 | 80 | 113 | 82 | ○ | 1.38 | 本発明 |
| 5 | ○ | ○ | 0.09 | 2 | 83 | 110 | 83 | ○ | 1.36 | 本発明 |
| 6 | ○ | ○ | 0.06 | 2 | 82 | 109 | 82 | ○ | 1.39 | 本発明 |
| 7 | ○ | ○ | 0.06 | 2 | 81 | 109 | 82 | ○ | 1.37 | 本発明 |

[0105] Ink jet record form of the result of a table 2 to this invention - It turns out that 1, 4-7 have

high-glossiness in a high ink absorption capacity, good ink absorptivity, and a drying list, and they do not have generating of a minute crack, and printing concentration is [dot size is high still smaller and] suitable for high definition ink jet record.

[0106] In example 2 example 1, the ink jet record form -21 was created like the example 1 except having changed [coating liquid 1-1] into the following [coating liquid -21].

[0107] It dried by applying using the following coating liquid -21 so that humid thickness might be set to 235 micrometers at the printing side side of the paper base material which performed rear-face processing like the example 1.

[0108]

[Coating liquid -21]

Pure water 837ml Particle calcium carbonate (mean diameter = about 0.03 micrometers) 257.4g Polyvinyl alcohol of average degree of polymerization 3200 11.5g (whenever [saponification] 85%) Ethyl acetate 35.3ml Surfactant -1 1.2g or less and coating liquid -21 are changed into 22-29, and it is coating liquid as well as the ink jet record form -21. - 22-29 are applied and it is an ink jet record form. - 22-29 were created.

[0109] In addition, it evaluated like the example 1.

[0110]

[Coating liquid -22]

Pure water 870ml Particle calcium carbonate (mean particle diameter = about 0.03 micrometers) 170g Polyvinyl alcohol of average degree of polymerization 3200 11.5g (whenever [saponification] 85%)

Surfactant -1 1.2g [coating liquid -23]

Pure water 905ml Particle calcium carbonate (mean particle diameter = about 0.03 micrometers) 80.5g Polyvinyl alcohol of average degree of polymerization 3200 11.5g (whenever [saponification] 85%)

Ethyl acetate 33.2ml Surfactant -1 1.2g [coating liquid -24]

Pure water 846ml Particle calcium carbonate (mean diameter = about 0.03 micrometers) 257.4g Polyvinyl alcohol of average degree of polymerization 3200 1.7g (whenever [saponification] 85%)

Ethyl acetate 20.5ml Surfactant -1 1.2g [coating liquid -25]

Pure water 847ml Particle calcium carbonate (mean particle diameter = about 0.03 micrometers) 257.4g Polyvinyl alcohol of average degree of polymerization 3200 1.32g (whenever [saponification] 85%) 195 Acetone 42ml Surfactant -1 1.2g [coating liquid -26]

Pure water 847ml Particle calcium carbonate (mean diameter = about 0.03 micrometers) 257.4g Polyvinyl alcohol of average degree of polymerization 3200 1.27g (whenever [saponification] 85%) Surfactant -1 1.2g [coating liquid -27]

Pure water 902ml Particle surface fatty-acid processing calcium carbonate (mean particle diameter = about 0.05 micrometers) 257.4g Polyvinyl alcohol of average degree of polymerization 3200 1.27g (whenever [saponification] 85%)

Surfactant -1 1.2g [coating liquid -28]

Pure water 837ml Particle calcium carbonate (mean diameter = about 0.03 micrometers) 332.4g Polyvinyl alcohol of average degree of polymerization 1700 11.9g (whenever [saponification] 80%) N-propyl alcohol 35.2ml Surfactant -1 1.2g [coating liquid -29]

Pure water 840ml Particle calcium carbonate (mean particle diameter = about 0.03 micrometers) 257.4g kappa-carrageenan 1.62g Ethyl acrylate 18.4ml Surfactant -1 The weight ratio of the activity individual particle of each ink jet record form and a water-soluble binder and 1.2g of the void volume were as follows. Moreover, the same assessment as an example 1 was performed to each ink jet record form.

[0111]

[A table 3]

| インクジェット 記録用紙 | 固体微粒子 水溶性A-インク- (重量比) | 空隙容量 (ml/m ²) | 乾燥膜厚 (μm) | 空隙率 (%) | ヒビ割れ | 備考 |
|-----------------|-----------------------------|------------------------------|--------------|------------|------|-----|
| 21 | 22.38 | 24 | 37 | 185 | ○ | 本発明 |
| 22 | 14.78 | (b) | 43(a) | (b) | ×× | 比較例 |
| 23 | 7 | 21 | 43 | 95 | ○ | 本発明 |
| 24 | 151.4 | 22 | 36.7 | 150 | ○ | 本発明 |
| 25 | 195 | 21.7 | 37.7 | 136 | ○ | 本発明 |
| 26 | 202.7 | 23 | 36.6 | 169 | ○ | 本発明 |
| 27 | 202.7 | (b) | 47.3 | (b) | ×× | 比較例 |
| 28 | 27.9 | 22.5 | 35 | 180 | ○ | 本発明 |
| 29 | 159 | 23.2 | 41.1 | 130 | ○ | 本発明 |

(b) : 評価できず

[0112]

[A table 4]

| 記録 用紙 | インク容量 | | インク 吸収性 | 乾燥性 | ドット直径 | | 光沢性 (%) | 色濃度 | 備考 |
|----------|-------|---|------------|-------|-------|-----|------------|------|-----|
| | ① | ② | | | K | K/Y | | | |
| 21 | ○ | ○ | 0.06 | 1分30秒 | 81 | 110 | 80 | 1.39 | 本発明 |
| 22 | △ | × | 0.19 | 6分 | 131 | 222 | 4 | 1.04 | 比較例 |
| 23 | ○ | ○ | 0.09 | 2分 | 83 | 108 | 84 | 1.37 | 本発明 |
| 24 | ○ | ○ | 0.06 | 1分30秒 | 82 | 109 | 83 | 1.40 | 本発明 |
| 25 | ○ | ○ | 0.06 | 1分30秒 | 82 | 108 | 82 | 1.39 | 本発明 |
| 26 | ○ | ○ | 0.06 | 2分 | 83 | 109 | 82 | 1.32 | 本発明 |
| 27 | △ | × | 0.20 | 4分 | 124 | 200 | 9 | 1.05 | 比較例 |
| 28 | ○ | ○ | 0.06 | 2分 | 81 | 110 | 84 | 1.32 | 本発明 |
| 29 | ○ | ○ | 0.06 | 2分 | 80 | 113 | 83 | 1.28 | 本発明 |

[0113] It turns out clearly from tables 3 and 4 like that the ink jet record form of this invention is excellent as compared with a comparative ink jet record form like an example 1.

[0114] the printing side side of the paper base material which performed rear-face processing like example 3 example 1 — simultaneous spreading was carried out, the following [coating liquid 3-1] was dried so that it might become 188 micrometers of humid thickness as a lower layer and might become 12 micrometers of humid thickness considering [coating liquid 3-2] as the upper layer, and the ink jet record form -30 was produced.

[0115]

[Coating liquid 3-1]

Pure water 935ml Particle silica with a mean particle diameter of about 0.07 micrometers 67.5g

Polyvinyl alcohol of average degree of polymerization 3500 18g (whenever [saponification] 89%)

Ethyl acetate 38.2ml Surfactant -1 1.2g [coating liquid 3-2]

Pure water 800ml Phenylcarbamoyl-ized gelatin 40g (the rate of an amino-group blockade = about 88%)

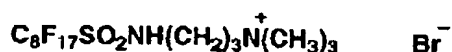
Polyvinyl pyrrolidone (K-90) 25g Polyethylene oxide (average molecular weight 100,000 [about])

12g Surfactant -1 1.2g Surfactant -2 0.6g Hardening agent -1 (tetrakis vinyl sulfonylmethane) 2.1g

[0116]

[Formula 2]

界面活性剤-2



[0117] Ink jet record form — It is the same as the ink jet record form -30 except having performed

humid thickness of 31: [coating liquid 3-2] by 8 micrometers.

[0118] Ink jet record form - It is the same as the ink jet record form -30 except having performed humid thickness of 32: [coating liquid 3-2] by 5 micrometers.

[0119] Ink jet record form - It is the same as the ink jet record form -30 except having changed the polyvinyl pyrrolidone of 33: [coating liquid 3-2] into polyvinyl alcohol (average degree of polymerization 500, whenever [saponification] 88%).

[0120] Ink jet record form - It is the same as the ink jet record form -30 except having changed the ethyl acetate of 34: [coating liquid 3-1] into H₂O.

[0121] the polyvinyl pyrrolidone of ink jet record form-35; [coating liquid 3-2] — Pao Genn (EP15) — the same as the ink jet record form -30 except having changed into the [first industrial incorporated company make].

[0122] Ink jet record form - It is the same as the ink jet record form -30 except having changed 36: [coating liquid 3-1] into [coating liquid -21].

[0123] Ink jet record form - It is the same as the ink jet record form -30 except having changed 37; [coating liquid 3-1] into [coating liquid -22].

[0124] Ink jet record form - It is the same as the ink jet record form -30 except having used 25g for RAPONAITO RDS (the Japan silica industrial incorporated company make) instead of the polyvinyl pyrrolidone of 38; [coating liquid 3-2], and polyethylene oxide.

[0125] Ink jet record form - It is the same as the ink jet record form -30 except having changed 39; [coating liquid 3-1] into [coating liquid -23].

[0126] The same assessment as an example 1 was performed to each ink jet record form.

[0127]

[A table 5]

| インクジェット 記録用紙 | 乾燥膜厚 (μ m) | ヒビ割れ | 備考 |
|-----------------|--------------------|------|-----|
| 30 | 39.2 | ○ | 本発明 |
| 31 | 39.0 | ○ | 本発明 |
| 32 | 38.8 | ○ | 本発明 |
| 33 | 39.4 | ○ | 本発明 |
| 34 | 39.6 | △ | 比較例 |
| 35 | 39.3 | ○ | 本発明 |
| 36 | 40.5 | ○ | 本発明 |
| 37 | 46.2 | × | 比較例 |
| 38 | 38.7 | ○ | 本発明 |
| 39 | 48.2 | ○ | 本発明 |

[0128]

[A table 6]

| インクジェット 記録用紙 | インク容量 | | インク 吸収性 | 乾燥性 | ドット直径 | | 光沢度 (%) | 色濃度 | 備考 |
|-----------------|-------|---|------------|-------|-------|-----|------------|------|-----|
| | ① | ② | | | K | K/Y | | | |
| 30 | ○ | ○ | 0.06 | 2分 | 83 | 107 | 89 | 1.39 | 本発明 |
| 31 | ○ | ○ | 0.06 | 2分 | 82 | 111 | 87 | 1.39 | 本発明 |
| 32 | ○ | ○ | 0.06 | 2分 | 81 | 111 | 84 | 1.39 | 本発明 |
| 33 | ○ | ○ | 0.06 | 2分 | 82 | 114 | 89 | 1.37 | 本発明 |
| 34 | △ | × | 0.17 | 5分 | 90 | 120 | 22 | 1.07 | 比較例 |
| 35 | ○ | ○ | 0.06 | 2分 | 82 | 107 | 86 | 1.34 | 本発明 |
| 36 | ○ | ○ | 0.06 | 1分30秒 | 83 | 107 | 87 | 1.38 | 本発明 |
| 37 | △ | × | 0.15 | 6分 | 100 | 141 | 13 | 1.06 | 比較例 |
| 38 | ○ | ○ | 0.06 | 2分 | 80 | 97 | 92 | 1.40 | 本発明 |
| 39 | ○ | ○ | 0.09 | 2分 | 83 | 108 | 88 | 1.32 | 本発明 |

[0129] It turns out clearly from a table 5 and a table 6 like that the ink jet record form of this invention is excellent as compared with a comparative ink jet record form like an example 1.

[0130]

[Effect of the Invention] As the example proved above, the ink jet record form by this invention is the outstanding ink absorptivity and high image concentration, and its gloss is still higher and it has the outstanding effectiveness without minute crack generating.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the ink jet record form which has improved especially ink absorptivity about the ink jet record form which records using water color ink.

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PRIOR ART

[Description of the Prior Art] although ink jet record makes the minute drop of ink fly by various working principles, and is made to adhere to ink jet record sheets, such as paper, and an image, an alphabetic character, etc. are recorded, a high speed, the low noise, and multiple-color-izing are comparatively easy — etc. — it has the advantage. About the blinding of a nozzle and the maintenance which had become a problem from the former by this method, from both sides of ink and equipment, amelioration progresses and it has spread through various fields, such as various printers, facsimile, and a computer terminal, quickly in current.

[0003] As an ink jet record form used by this ink jet recording method, also when a printing dot laps [that a color tone is brightly skillful and absorption of ink] early, the diffusion to the longitudinal direction of ink flowing out or not spreading and a printing dot is not large [the concentration of a printing dot is high, and] beyond the need, and it is required that the circumference should be smooth and should not fade etc.

[0004] Since it becomes nonuniformity, and the color of each other in the border area of a color which a drop causes a HAJIKI phenomenon on an ink jet record form, and is different spreads and it is easy to reduce image quality greatly in case the liquid ink drop of two or more colors laps and is recorded, when especially ink rate of absorption is slow, it is required to give ink absorptivity high as an ink jet record form.

[0005] In order to solve these problems, very many techniques are proposed from the former.

[0006] As the pigment in the clad layer indicated by the ink jet record form which carried out humidity of the coating for surface treatment to the low size stencil indicated by JP,52-53012,A, the ink jet record form which prepared the coated layer of ink absorptivity in the support surface indicated by JP,55-5830,A, and JP,56-157,A The ink jet record form containing non-colloid silica powder, the ink jet record form which used together the inorganic pigment indicated by JP,57-107878,A and the organic pigment, The ink jet record form which has two hole distribution peaks indicated by JP,58-110287,A, The ink jet record form which consists of a vertical two-layer porous layer indicated by JP,62-111782,A, The ink jet record form which has the infinite form crack indicated by JP,59-68292,A, 59-123696, 60-18383, etc., The ink jet record form which has the impalpable powder layer indicated by JP,61-135786,A, 61-148092, 62-149475, etc., JP,63-252779,A, JP,1-108083,A, 2-136279, The ink jet record form containing the pigment which has the specific physical-properties value indicated by 3-65376, 3-27976, etc., or a particle silica, JP,57-14091,A, 60-219083, 60-210984, 61-20797, 61-188183, JP,5-278324,A, 6-92011, 6-183134, 7-137431, The ink jet record form containing particle silicas, such as a colloid silica indicated by 7-276789 etc., And JP,2-276671,A, 3-67684, 3-215082, Many ink jet record forms containing the hydrated alumina particle indicated by 3-251488, 4-67986, 4-263983, 5-16517, etc. are known.

[0007] However, since many ink absorbing layers with many openings will have irregularity with micro interface with air and coat front face, the incident light to an ink absorbing layer is scattered about or transparency is barred when an ink absorbing layer absorbs ink or it consists of only layers which have many openings for holding, it becomes or tends to be hard to come out opaquely lusterless.

[0008] Moreover, in order to form an opening, there is a fault out of which the smooth nature on the front face of a coat by own irregularity of a pigment or the irregularity of the secondary floc of

a pigment falls, and gloss cannot come easily.

[0009] Furthermore, although it is the inclination which the thickness of an opening layer increases in order to increase an opening in order to raise ink absorption capacity, since light stops easily being able to reach the ink which permeated the opening, an image becomes whitish, and it has the fault of color repeatability and the depth of shade falling.

[0010] Therefore, although the increase of voidage and examination to which it carries out and thickness raises voidage with a thin opening layer of an opening layer are also performed, it has the dispersibility of a pigment, coating liquid viscosity lifting, and a problem with still more various cracks after spreading of an ink acceptance layer, and desiccation etc.

[0011] Therefore, it was difficult to obtain the high image of color repeatability or the depth of shade, maintaining high glossiness and transparency in an ink absorbing layer with many openings.

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EFFECT OF THE INVENTION

[Effect of the Invention] As the example proved above, the ink jet record form by this invention is the outstanding ink absorptivity and high image concentration, and its gloss is still higher and it has the outstanding effectiveness without minute crack generating.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] This invention is made in view of the above-mentioned actual condition, the 1st object of this invention is obtaining the ink jet record form which is the outstanding ink absorptivity and high image concentration, the 2nd object has still higher gloss, and it is in obtaining an ink jet record form without minute crack generating.

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MEANS

[Means for Solving the Problem] The above-mentioned object of this invention is attained by the following configurations.

[0014] 1. Ink jet record form characterized by being ink opening acceptance layer formed on base material in ink jet record form which comes to prepare at least one or more-layer ink acceptance layer by carrying out spreading desiccation of liquid with which at least one layer of this ink acceptance layer contained solid-state particle and low-boiling point organic solvent at least.

[0015] 2. Ink jet record form given in said 1 characterized by voidage of ink opening acceptance layer containing said solid-state particle being more than 100 capacity %.

[0016] 3. Said 1 which contains solid-state particle and hydrophilic binder in at least one layer of said ink opening acceptance layers, and is characterized by weight ratios to these one sort of hydrophilic binders of this solid-state particle being 10 or more and less than 200, or ink jet record form given in 2.

[0017] 4. Said 1 and 2 which are characterized by being ink opening acceptance layer formed by said ink opening acceptance layer carrying out spreading desiccation of liquid which has solid-state particle and hydrophilic binder at least, was made to carry out flocculation of this solid-state particle under hydrophilic binder existence, and was obtained, or ink jet record form given in 3.

[0018] 5. Ink-jet record form given in said any 1 term of 1-4 which layer in the most distant location from this base material makes hydrophilic binder subject, and is characterized by to have ink acceptance layer which is ink acceptance layer (it is described as swelling layer below) which does not have opening, and has opening between this swelling layer and this base material in ink-jet record form which comes to prepare at least one or more-layer ink acceptance layer on base material.

[0019] Hereafter, this invention is explained to a detail.

[0020] The ink opening acceptance layer (only henceforth an opening layer) which the ink jet record form of this invention has consists of the opening formed an inorganic or organic particle and between them.

[0021] The formation approach of a desirable opening is the following two sorts.

[0022] (1) the solid-state particle which has the volume more than equivalent weight (preferably 1.0 or more times) in general to a hydrophilic binder — and — or the approach of applying the coating liquid containing a particle oil droplet and a hydrophilic binder on a base material, and creating an opening between solid-state particles — (2) The approach mean particle diameter makes solid-state particle about 0.1 micrometers or less condense at the time of coating liquid adjustment or coat formation, forms a secondary particle or the three-dimensional structure, and creates an opening, 20-200A, the magnitude of the above-mentioned opening is 40-100A still more preferably, and it is preferably desirable to set up so that it may become the conditions in which the magnitude of packing and the manufacture conditions at the time of coat formation also form such an opening.

[0023] The approach of creating without taking a complicated production process from a viewpoint referred to as that the approach of of the above (1) and (2) creates an ink jet record form by low cost on the other hand is desirable.

[0024] As for the above-mentioned opening layer of the ink jet record form of this invention, it is

desirable to have the binder, in order to maintain the property as a coat.

[0025] Although various kinds of conventionally well-known binders can be used as this binder, the hydrophilic binder with which permeability higher than ink is acquired is used preferably. However, it is important for a hydrophilic binder to swell, to swell in the activity of a hydrophilic binder, at the time of the osmosis in early stages of ink, and not to take up an opening, and a hydrophilic binder with low bloating tendency is comparatively used preferably near a room temperature from this viewpoint. Especially a desirable hydrophilic binder is the polyvinyl alcohol or cation conversion polyvinyl alcohol of perfect or partial saponification, and is **.

[0026] one especially desirable also in polyvinyl alcohol — whenever [saponification] — 80 or more parts — or full saponification is carried out. Moreover, from a viewpoint which improves coat brittleness, 500–10000 are desirable especially desirable, and, as for average degree of polymerization, the thing of 1000–5000 is used.

[0027] Moreover, it is polyvinyl alcohol which has the 1–3rd class amino group which is indicated by JP,61–10483,A, for example, and the 4th class ammonium in the principal chain of the above-mentioned polyvinyl alcohol, or a side chain as cation conversion polyvinyl alcohol.

[0028] Moreover, although other hydrophilic binders can be made to contain in said opening layer, as for those hydrophilic binders, it is preferably desirable that it is 20 or less % of the weight in general to the above-mentioned polyvinyl alcohol or cation conversion polyvinyl alcohol.

[0029] When forming the opening layer of the ink jet record form of this invention, as for especially a capacity factor [as opposed to the hydrophilic binder of a solid-state particle the case of the above (1) or the opening creation by (2) which is a desirable mode], three or more are desirable, and it is desirable to carry out to four especially or more.

[0030] As for the capacity of the opening of the opening layer of the ink jet record form of this invention, it is desirable that they are two or more 20 ml/m per two 1m of ink jet record forms. When void volume is less than [20ml //m] two, although the absorptivity of the amount of low ink is good, ink overflows in the case of printing of the high amount of ink, image quality is reduced or problems, like drying [after printing] is late tend to produce it.

[0031] On the other hand, although especially the upper limit of void volume is not restricted, the desiccation thickness of an opening layer is two or less 40 ml/m in general from it being required in order that making it 50 micrometers or less in general may not worsen the physical characteristic of coats, such as a crack.

[0032] In the approach of the above (1), in order to attain two or more 20 ml/m void volume, it is desirable to carry out voidage of an opening layer more than 100 capacity %.

[0033] Void volume is the value which deducted the total amount of the capacity of solid content, such as a binder in an opening layer, and various kinds of bulking agents, from the desiccation thickness in an opening layer, and voidage shows the rate of the amount of openings to the capacity of these solid content here.

[0034] It is good to carry out voidage preferably more than 150 capacity %. Although the upper limit of voidage generally changes with the class of bulking agent, or the classes of binder, generally it is below 200 capacity % from the reinforcement as a coat, brittleness, etc.

[0035] Especially in order to carry out voidage to more than 100 capacity % preferably, the ratio of a solid-state particle and a hydrophilic binder is important, ten or more have a desirable weight ratio to the hydrophilic binder of this solid-state particle, and it is more desirable that carrying out to less than 200 carries out. This weight ratio becomes difficult [it / for void volume to obtain 100% or more less than by ten], and the brittleness of a coat deteriorates in the case of 200 or more.

[0036] When there is an opening layer in the opening layer containing a solid-state particle, as a solid-state particle, a well-known solid-state particle inorganic [various kinds of] or organic can be conventionally used in an ink jet record form.

[0037] As an example of the non-subtlety particle used for the above-mentioned object, white inorganic pigments, such as precipitated calcium carbonate, whiting, a magnesium carbonate, a kaolin, clay, talc, a calcium sulfate, a barium sulfate, a titanium dioxide, a zinc oxide, zinc hydroxide, zinc sulfide, zinc carbonate, a hydrotalcite, aluminum silicate, the diatom earth, a calcium silicate, a magnesium silicate, synthetic amorphous silica, colloidal silica, an alumina, a colloidal alumina,

pseudo-boehmite, an aluminum hydroxide, a lithopone, a zeolite, and a magnesium hydroxide, etc. can be mentioned.

[0038] Such a non-subtlety particle may be added in the condition of being used into a binder after homogeneity has distributed having also formed secondary floc with the primary particle, and having distributed in the binder.

[0039] On the other hand as an example of an organic particle, polystyrene, polyacrylic ester, polymethacrylic acid ester, polyacrylamides, polyethylene, polypropylene, a polyvinyl chloride, polyvinylidene chlorides or these copolymers, a urea-resin, or melamine resin is mentioned.

[0040] It is more desirable than the point of high concentration being attained in this invention, and a clear image being recorded, and being able to manufacture by low cost to use the solid-state particle chosen from a hydrated alumina particle, a silica particle, and a calcium carbonate as a solid-state particle.

[0041] The alumina or hydrated alumina preferably used for this invention is the porosity alumina whose sum of the pore volume in which a radius (minor axis) has 3–10nm is 0.2 – 2 ml/g, or its hydrated compound. The measurement means of pore volume can be measured with a well-known nitrogen adsorption process to an alumina or the desiccation solid content of hydrated alumina.

[0042] An alumina or hydrated alumina may be crystallinity, or may be amorphous, and a configuration can use the object of the configuration of arbitration, such as an infinite form particle, a spherical particle, and a needlelike particle.

[0043] The synthetic silica which could use various kinds of well-known silica system particles by the ink jet conventionally as a silica system particle preferably used for this invention, for example, was compounded by wet or the gaseous-phase method, colloidal silica, and the silica of the configuration of the porosity silica arbitration which a primary particle condenses and forms the secondary particle can be used. As such an example, for example, the synthetic amorphous silica indicated by JP,55-51583,A, 56-148583, etc., For example, the silica ultrafine particle compounded by the gaseous-phase method indicated by JP,60-204390,A, The synthetic infinite form silica containing the fluorine indicated by JP,60-222282,A, The synthetic infinite form silica in which surface treatment was carried out by the silane coupling agent indicated by JP,60-224580,A and 62-178384, For example, the spherical silica indicated by JP,62-183382,A and 63-104878, The synthetic silica particle whose Na₂O content indicated by JP,63-317381,A is 0.5 % of the weight or more, The specific surface area indicated by JP,1-115677,A The synthetic silica particle more than 100m²/g, The synthetic silica particle which was indicated by JP,62-286787,A and by which alumina surface treatment was carried out, The synthetic silica particle by which surface treatment was carried out by calcium, Mg, or Ba indicated by JP,1-259982,A, The colloidal silica oil absorption was indicated to be by a 180ml [/g] or more composition silica particle and JP,57-14091,A, The cationic colloidal silica indicated by JP,60-219084,A, JP,6-92011,A, 6-297830, and 7-81214, And the colloidal silica which connected in the shape of [which was indicated by JP,5-278324,A and 7-81214] a rosary, or branched can be mentioned.

[0044] However, in order to obtain high glossiness and high void volume, it is desirable to use the silica ultrafine particle whose mean particle diameter is 7–30nm. The reliance of this silica particle is also good by the object which cation denaturation could be carried out in the front face, and was processed by aluminum, calcium, Mg, Ba, etc.

[0045] As a calcium carbonate preferably used for the ink jet record form of this invention For example, JP,57-12486,A, 57-129778, 58-55283, The precipitated calcium carbonate which has specific surface area in the specification indicated by 61-20792, The needle pillar-shaped calcium carbonate indicated by JP,63-57277,A ***** JP,4-250091,A, The calcium-carbonate particle which the specific needlelike primary particle indicated by JP,3-251487,A condensed, and formed the secondary particle, the needle which has the specific oil absorption indicated by JP,4-250091,A and 4-260092 — a pillar-shaped prismatic crystal Argo night calcium carbonate, the spherical precipitated calcium carbonate indicated by JP,7-40648,A are mentioned.

[0046] In this case, since high glossiness and high void volume can be obtained, it is desirable that particle size uses calcium-carbonate particle about 0.1 micrometers or less, and it is desirable to use the calcium-carbonate particle especially whose mean particle diameter is 10–50nm.

[0047] It is desirable for a solid-state particle and a hydrophilic binder to carry out a strong

interaction comparatively, and to form a flocculation object on the other hand, when performing opening formation by the above (2). Such a solid-state particle and a hydrophilic binder can be suitably chosen from from, while describing above, for example, they can mix those water solutions with a water distribution object, and can judge them comparatively easily from the viscosity lifting. [0048] A desirable gestalt mixes the water solution [A] (usually 1 – 20 % of the weight) and solid-state particle dispersion liquid [B] (usually 1 – 30 % of the weight) of a hydrophilic binder, and can use that from which the viscosity of the obtained mixed liquor becomes at least 1.5 or more times with higher [A] or [B].

[0049] Especially a desirable thing is a polymer which has a hydroxyl group at least as a hydrophilic binder in this invention, and polyvinyl alcohol and especially cationic polyvinyl alcohol are desirable.

[0050] Moreover, as a solid-state particle, especially the particle silica and magnesium silicate whose mean particle diameter is 0.005–0.1 micrometers are desirable.

[0051] As for the low-boiling point organic solvent of this invention, what does not evaporate and remain at the time of spreading desiccation is desirable, and 130 degrees C or less of 100 degrees C or less of boiling points are an organic solvent 80 degrees C or less most preferably especially preferably. Moreover, 1% of the weight or more of a low-boiling point organic solvent has the desirable solubility to the water in a room temperature.

[0052] A methanol, ethanol, isopropanol, n-propanol, n-butanol, 2-methoxyethanol, an acetone, a methyl ethyl ketone, 2-hexanone, ethyl acetate, vinyl acetate, isopropyl acetate, n propyl acetate, n-butyl acetate, an ethyl formate, formic-acid propyl, ethyl butylate, butanoic acid vinyl, methyl butyrate, a methyl acrylate, a tetrahydrofuran, an acetonitrile, 1, 2-dimethoxyethane, isopropyl vinyl ether, 1,4-dioxane, etc. are mentioned as an example of a low-boiling point organic solvent. These may use two or more sorts together.

[0053] As for such a low-boiling point organic solvent, it is desirable to use one to 15% of the weight to a hydrophilic binder preferably.

[0054] Although various change of the concentration of this low-boiling point organic solvent is carried out at a class, concentration, etc. of the concentration of a solid-state particle, and a hydrophilic binder in case the coating liquid containing the above-mentioned low-boiling point organic solvent is prepared, generally the concentration in coating liquid is 0.5 – 10 % of the weight preferably 0.1 to 15% of the weight.

[0055] Moreover, as long as the addition stage of an organic solvent is before spreading, what kind of stage at the time of coating liquid preparation is sufficient as it, and it may specifically be the time of mixing with a hydrophilic binder solution or just before spreading, ****, or the stage to become at the time of distribution of a solid-state particle.

[0056] By adding the low-boiling point organic solvent of this invention in coating liquid, in the opening formation by the approach of the above (1), formation of the big and rough particle by condensation of a solid-state particle is controlled, while the paint film which has high gloss is obtained, void volume increases and ink absorptivity is improved.

[0057] Moreover, in the approach of the above (2), since the interaction of a solid-state particle and a hydrophilic binder is comparatively strong, generally it is easy to thicken coating liquid, and workability, spreading nature, and productivity tend to fall. In this case, by adding the low-boiling point organic solvent of this invention, coating liquid viscosity carries out adhesiveness-reducing, and workability, spreading nature, and productivity improve. Moreover, rapid thickening of coating liquid according to lowering of paint film temperature and evaporation of the organic solvent itself rapidly by evaporation of an organic solvent in after coating liquid desiccation can enable it to spray a strong desiccation wind, and spreading speed can also be increased greatly.

[0058] Various kinds of additives can be made to contain if needed in the layer of the arbitration by the side of the ink opening acceptance layer of the ink jet record form of this invention.

[0059] For example, an ultraviolet ray absorbent given in JP,57-74193,A, 57-87988, and 62-261476, JP,57-74192,A, 57-87989, 60-72785, The fading inhibitor indicated by 61-146591, JP,1-95091,A, 3-13376, etc., An anion, a cation or the various surfactants of Nonion, JP,59-42993,A, The fluorescent brightener indicated by 59-52689, 62-280069, 61-242871, JP,4-219266,A, etc., Various well-known additives, such as lubricant, such as pH regulators, such as a sulfuric acid, a phosphoric acid, a citric acid, a sodium hydroxide, a potassium hydroxide, and potassium carbonate, a

defoaming agent, and a diethylene glycol, antiseptics, a thickener, a hardening agent, an antistatic agent, and a mat agent, can also be made to contain.

[0060] An inorganic or organic hardening agent can be used as a hardening agent, for example, chromium alum, formaldehyde, a glyoxal, an epoxy system compound, a vinyl sulfone system compound, an acryloyl system compound, s-triazine system compound, N-methylol system compound, a carbodiimide system compound, ethylene imino *****, etc. can be used.

[0061] Although especially a limit does not have the amount of the spreading solid content by the side of the ink recording surface in the ink jet record form of this invention, 5 – 60 g/m² is desirable to an ink jet record form in general, and 10 – 40 g/m² is more desirable. In addition, from the field of prevention of the curl after record image formation, it is good to form as thinly as possible.

[0062] Into the configuration layer of the arbitration by the side of the ink recording surface of this invention, an alkali-metal weak acid salt the poly allylamine of publications, such as the poly cation polyelectrolyte of JP,56-84992,A, a basic latex polymer of JP,57-36692,A, JP,4-15744,B, JP,61-58788,A, and 62-174184, and given in JP,61-47290,A etc. can be used more than a kind as a deck-watertight-luminaire-ized agent of an image.

[0063] As a base material of an ink jet record form, a thing well-known as a record form for ink jets can be conventionally used suitably by this invention.

[0064] Also **** which mentions the film which consists of ingredients, such as polyester system resin, diacetate system resin, triacetate system resin, acrylic resin, polycarbonate system resin, polyvinyl chloride system resin, polyimide system resin, cellophane, and celluloid, a plate, a glass plate, etc. as a transparence base material, for example, and in this, the thing of a property which bears the radiant heat when being used as an OHP is desirable, and especially polyethylene terephthalate is desirable. As thickness of such a transparent base material, about 10-200 micrometers is desirable. It is desirable from an adhesive viewpoint of an ink opening acceptance layer, a back layer, and a base material to prepare a well-known under-coating layer in an ink opening acceptance layer [of a transparence base material] and back layer side.

[0065] Moreover, what carried out opacification processing of the sheet which consists of common paper, a synthetic paper, resin coat paper, cloth, timber, a metal, etc. as a base material used when there is no transparent need, for example, a plate, and the above-mentioned translucency base material with the well-known means can be mentioned. The so-called White pet which comes to add white pigments to the resin coat paper (the so-called RC paper) which has the polyolefin resin enveloping layer which added white pigments etc. at least to one side of a base paper as an opaque base material, and polyethylene terephthalate is desirable.

[0066] It is desirable to perform corona discharge treatment, undercoating processing, etc. to a base material in advance of spreading of an ink opening acceptance layer for the object, such as to enlarge bond strength of the above-mentioned base material and an ink opening acceptance layer. Furthermore, the record sheet of this invention does not necessarily need to be colorlessness, and may be a colored record sheet.

[0067] In photograph image quality, near and especially since the image of high quality is moreover obtained by low cost, as for a record image, it is desirable to use the paper base material which laminated both sides of a paper base material with polyethylene in the ink jet record form of this invention. The paper base material laminated with such polyethylene is explained below.

[0068] The stencil used for a paper base material uses wood pulp as the main raw material, and, in addition to wood pulp, paper making is carried out using synthetic fibers, such as synthetic pulps, such as polypropylene, or nylon, and polyester, if needed. Although both LBKP, LBSP, NBKP, NBSP LDP and NDP LUKP and NUKP can be used as wood pulp, it is desirable to use more many [for a staple fiber] LBKP, NBSP(s), LBSP(s), and NDP(s) and LDP(s). However, it reaches LBSP or the ratio of LDP has 10 % of the weight or more and 70 desirable % of the weight or less.

[0069] The pulp of the above-mentioned pulp which chemical pulp with few impurities (sulfate pulp and sulfite pulp) was used preferably, and performed bleaching processing, and raised the whiteness degree is also useful.

[0070] In a stencil, flexible-ized agents, such as moisture hold-back agents, such as paper reinforcing agents, such as white pigments, such as sizing compounds, such as a higher fatty acid

and an alkyl ketene dimer, a calcium carbonate, talc, and titanium oxide, starch, polyacrylamide, and polyvinyl alcohol, a fluorescent brightener, and polyethylene glycols, a dispersant, and the 4th class ammonium, etc. can be added suitably.

[0071] The freshness of the pulp used for paper making has desirable 200–500 cc by convention of CSF, and 30 thru/or 70% have the desirable sum of 24-mesh residue weight % and weight % for 42-mesh ** as which the fiber length after beating is specified to JIS-P -8207. In addition, as for weight % of the four-mesh residue, it is desirable that it is 20 or less % of the weight.

[0072] The basis weight of a stencil has 30 thru/or desirable 250g, and 50 thru/or especially its 200g are desirable. The thickness of a stencil has 40 thru/or desirable 250 micrometers.

[0073] After a paper-making phase or paper making, calender processing of the stencil can be carried out and it can also give the Takahira slippage. A stencil consistency has 0.7 thru/or common 1.2 g/m² (JIS-P -8118). Furthermore, stencil stiffness has 20 thru/or desirable 200g on the conditions specified to JIS-P -8143.

[0074] A surface sizing compound may be applied to a stencil front face, and the same sizing compound as the size which can be added among said stencil as a surface sizing compound can be used for it.

[0075] When measured by the hot water extraction method specified by JIS-P -8113, as for pH of a stencil, it is desirable that it is 5–9.

[0076] Although the polyethylene which covers a stencil front face and a rear face is mainly the polyethylene (LDPE) of a low consistency, and/or polyethylene (HDPE) of high density, a part of other LLDPE(s), polypropylene, etc. can be used for it.

[0077] As for especially the polyethylene layer by the side of an ink opening acceptance layer, what added the titanium oxide of a rutile or an anatase mold in polyethylene as widely performed by the photographic paper for photographs, and improved opacity and a whiteness degree is desirable. A titanium oxide content is 4 – 13 % of the weight preferably three to 20% of the weight in general to polyethylene.

[0078] polyethylene coat paper can also use the object in which a mat side which performs the so-called mold attachment processing and is acquired with the usual photographic printing paper, and the silky surface were formed, by this invention, in case melting push appearance also of also using as glossy paper is carried out and it coats polyethylene on a stencil front face.

[0079] After preparing an ink opening acceptance layer and a back layer, the amount of the polyethylene used of the front flesh side of a stencil is damp and range whose 20–40-micrometer and back layer side the polyethylene layer by the side of an ink absorbing layer is 10–30 micrometers in general, although it is chosen so that the curl by highly-humid-izing may be optimized.

[0080] Furthermore, as for the above-mentioned polyethylene coat paper base material, it is desirable to have the following properties.

[0081] A lengthwise direction by the reinforcement specified by :JIS-P -8113 in hauling strength ** 2 thru/or 30kg, A lengthwise direction by the convention approach by ** tear on-the-strength:JIS-P -8116 with desirable longitudinal directions being 1 thru/or 20kg 10 thru/or 200g, A longitudinal direction on the conditions specified to 20 thru/or ** compressibility ≥ 103 kgf/cm²** surface Beck smoothness:JIS-P-8119 with desirable 200g 20 seconds or more, Although 500 seconds or more are especially preferably desirable as a glossy surface, especially 90% or more is desirable 85% or more by the approach by ** opacity:JIS-P -8119 which may be less than [this] in the so-called mold attachment article.

[Translation done.]

* NOTICES *

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- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

EXAMPLE

[Example] Although the example of this invention is given and explained below, this invention is not limited to these examples. In addition, in an example, especially, as long as there is no notice, oven-dry-weight % is shown "%."

[0083] The paper base material which covered 1100g of examples/, and stencil both sides of m2 with polyethylene (it is 7% of the weight of anatase mold titanium-dioxide content in the polyethylene layer by the side of 140 micrometers in thickness, and a recording surface.) The layer which applies to a recording surface side so that humid thickness may turn the following [coating liquid 1-1] to 188 micrometers in [having the layer which contains alkali treatment gelatin 1.2 g/m2 and a hardening agent as a back layer in the rear-face side of a recording surface], dries, and has an opening was painted on the base material, and the ink jet record form -1 was obtained.

[0084]

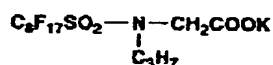
[Coating liquid 1-1]

Pure water 935ml Particle silica with a mean particle diameter of about 0.07 micrometers 67.5g
Polyvinyl alcohol of average degree of polymerization 3500 18g (whenever [saponification] 89%)
Ethyl acetate 38.2ml Surfactant -1 1.2g of void volume of this coat was 23 ml/m2.

[0085]

[Formula 1]

界面活性剤-1



[0086] Next, ink jet record form which changed spreading using [coating liquid 1-1] as follows in the ink jet record form -1 - 2-7 were created like the ink jet record form -1.

[0087] Ink jet record form - It is the same as the ink jet record form -1 except having changed the ethyl acetate of 2: [coating liquid 1-1] into pure water.

[0088] Ink jet record form - Three: [coating liquid 1-2]

Pure water 980ml Particle silica with a mean particle diameter of about 0.07 micrometers 48.2g
Polyvinyl alcohol of average degree of polymerization 3500 12.8g (whenever [saponification] 89%)
Surfactant -1 The layer which applies the 1.2g above-mentioned coating liquid so that humid thickness may turn to 125 micrometers, carries out spreading desiccation again with the above-mentioned coating liquid further after desiccation, and has an opening was painted on the base material.

[0089] It is the same as the ink jet record form -1 except having reduced the amount of the ethyl acetate of the coating liquid [coating liquid 1-1] of the ink jet record form-4 above to 18 ml/m2, and having increased the amount of pure water by 10.2ml.

[0090] Ink jet record form - It is the same as the ink jet record form -1 except having changed the ethyl acetate of 5: [coating liquid 1-1] into isopropanol.

[0091] Ink jet record form - It is the same as the ink jet record form -1 except having changed the ethyl acetate of 6: [coating liquid 1-1] into the acetone.

[0092] Ink jet record form - It is the same as the ink jet record form -1 except having changed the ethyl acetate of 7: [coating liquid 1-1] into the methyl ethyl ketone.

[0093] About each obtained ink jet record form, using ink jet printer MJ[by Seiko Epson, Inc.]-5100C, the assessment pattern was printed and the following items were evaluated.

[0094] (1) Ink absorption capacity : when 30% of the amount of the maximum ink of ** yellow, 60% of regurgitation of the amount of the maximum ink of each ink of cyanogen, and Magenta ink was made to breathe out at the time of 60% of regurgitation of the amount of the maximum ink of each ink of ** yellow and cyanogen, the condition of the overflow of the ink in each case was observed visually.

[0095] [The overflow of ink]

O x dried within about 10 seconds although it is overflowing slightly immediately after **:printing which does not overflow at all immediately after :printing : it takes a front face 10 seconds or more to overflow immediately after printing and to dry.

[0096] (2) ink absorptivity: — ** yellow and cyanogen — it becomes 30% of the amount of the maximum ink, respectively — as — Homogeneity was made to breathe out, it recorded, 20 red-reflex concentration of the solid section was measured using the microdensitometer (aperture =200micrometerphi), and the value broken by average reflection density in quest of the standard deviation of the variation in the concentration was calculated.

[0097] When ink absorptivity is good, the value of non-Lycium chinense becomes [nonuniformity] small at an image, but if ink absorptivity falls, this each other liquid ink drops will cause beading mutually in the record paper, it will become nonuniformity, and this value will increase.

[0098] (3) drying: — the single dot of black was printed in the single dot diameter (K) of (4) dot diameter:black ink and the yellow solid printing section which found time amount until it leaves a regular paper in piles and ink stops imprinting 60% printing section of yellow and a Magenta in a regular paper after after [printing] fixed time amount progress, and they were observed and asked for the diameter under the microscope (K/Y). It asked for the diameter as the average of the diameter when measuring the area of 20 dots, respectively and carrying out the circle conversion of this (unit: micrometer).

(5) Glossiness : gloss was measured for the printing side 60 degrees using the deflection glossmeter (VGS-1001DP) by Nippon Denshoku Industries Co., Ltd.

[0099] (6) The minute crack of a paint film : the crack of a paint film took the microphotography by one 50 times the scale factor of this about the cyanogen printing section, and evaluated it by viewing using this photograph.

[0100] a valuation basis has no generating of O; crack — x; which has generating of **:crack slightly — the crack printed the (7) printing concentration:black ink which is accepted considerably and which can be checked by looking even if it does not do xx:amplification of, and measured printing concentration with optical density.

[0101] The higher one of a numeric value shows that printing concentration is high.

[0102] The void volume of each ink jet record form etc. was as follows.

[0103]

[A table 1]

| インクジェット 記録用紙 | 湿润膜厚 (μ m) | 乾燥膜厚 (μ m) | 空隙容量 (ml/m ²) | 空隙率 (%) | 備考 |
|-----------------|--------------------|--------------------|------------------------------|------------|-----|
| 1 | 188 | 38.4 | 23 | 149 | 本発明 |
| 2 | 188 | 37(a) | 16 | 76 | 比較例 |
| 3 | 125×2 | 52 | 23 | 79 | 比較例 |
| 4 | 188 | 36.4 | 20 | 122 | 本発明 |
| 5 | 188 | 42 | 20.3 | 91 | 本発明 |
| 6 | 188 | 37.4 | 22.6 | 152 | 本発明 |
| 7 | 188 | 38.4 | 22.5 | 141 | 本発明 |

(a) ; 塗布表面の凹凸が激しく真の膜厚ではない

[0104]

[A table 2]

| 記録 用紙 | インク容量 | | インク 吸収性 | 乾燥性 (分) | ドット直径 | | 光沢度 (%) | 比割れ | 色濃度 | 備考 |
|----------|-------|---|------------|------------|-------|-----|------------|-----|------|-----|
| | ① | ② | | | K | K/Y | | | | |
| 1 | ○ | ○ | 0.06 | 2 | 82 | 109 | 84 | ○ | 1.39 | 本発明 |
| 2 | △ | × | 0.18 | 5 | 120 | 210 | 8 | × | 1.03 | 比較例 |
| 3 | ○ | ○ | 0.08 | 2 | 90 | 122 | 76 | ○ | 1.09 | 比較例 |
| 4 | ○ | ○ | 0.07 | 2 | 80 | 113 | 82 | ○ | 1.38 | 本発明 |
| 5 | ○ | ○ | 0.09 | 2 | 83 | 110 | 83 | ○ | 1.36 | 本発明 |
| 6 | ○ | ○ | 0.06 | 2 | 82 | 109 | 82 | ○ | 1.39 | 本発明 |
| 7 | ○ | ○ | 0.06 | 2 | 81 | 109 | 82 | ○ | 1.37 | 本発明 |

[0105] Ink jet record form of the result of a table 2 to this invention - It turns out that 1, 4-7 have high-glossiness in a high ink absorption capacity, good ink absorptivity, and a drying list, and they do not have generating of a minute crack, and printing concentration is [dot size is high still smaller and] suitable for high definition ink jet record.

[0106] In example 2 example 1, the ink jet record form -21 was created like the example 1 except having changed [coating liquid 1-1] into the following [coating liquid -21].

[0107] It dried by applying using the following coating liquid -21 so that humid thickness might be set to 235 micrometers at the printing side side of the paper base material which performed rear-face processing like the example 1.

[0108]

[Coating liquid -21]

Pure water 837ml Particle calcium carbonate (mean diameter = about 0.03 micrometers) 257.4g
Polyvinyl alcohol of average degree of polymerization 3200 11.5g (whenever [saponification] 85%)
Ethyl acetate 35.3ml Surfactant -1 1.2g or less and coating liquid -21 are changed into 22-29, and it is coating liquid as well as the ink jet record form -21. - 22-29 are applied and it is an ink jet record form. - 22-29 were created.

[0109] In addition, it evaluated like the example 1.

[0110]

[Coating liquid -22]

Pure water 870ml Particle calcium carbonate (mean particle diameter = about 0.03 micrometers) 170g
Polyvinyl alcohol of average degree of polymerization 3200 11.5g (whenever [saponification] 85%)

Surfactant -1 1.2g [coating liquid -23]

Pure water 905ml Particle calcium carbonate (mean particle diameter = about 0.03 micrometers) 80.5g
Polyvinyl alcohol of average degree of polymerization 3200 11.5g (whenever [saponification] 85%)

Ethyl acetate 33.2ml Surfactant -1 1.2g [coating liquid -24]

Pure water 846ml Particle calcium carbonate (mean diameter = about 0.03 micrometers) 257.4g
Polyvinyl alcohol of average degree of polymerization 3200 1.7g (whenever [saponification] 85%)

Ethyl acetate 20.5ml Surfactant -1 1.2g [coating liquid -25]

Pure water 847ml Particle calcium carbonate (mean particle diameter = about 0.03 micrometers) 257.4g
Polyvinyl alcohol of average degree of polymerization 3200 1.32g (whenever

[saponification] 85%) 195 Acetone 42ml Surfactant -1 1.2g [coating liquid -26]

Pure water 847ml Particle calcium carbonate (mean diameter = about 0.03 micrometers) 257.4g
Polyvinyl alcohol of average degree of polymerization 3200 1.27g (whenever [saponification] 85%)

Surfactant -1 1.2g [coating liquid -27]

Pure water 902ml Particle surface fatty-acid processing calcium carbonate (mean particle diameter = about 0.05 micrometers) 257.4g
Polyvinyl alcohol of average degree of polymerization 3200 1.27g (whenever [saponification] 85%)

Surfactant -1 1.2g [coating liquid -28]

Pure water 837ml Particle calcium carbonate (mean diameter = about 0.03 micrometers) 332.4g
Polyvinyl alcohol of average degree of polymerization 1700 11.9g (whenever [saponification] 80%)

N-propyl alcohol 35.2ml Surfactant -1 1.2g [coating liquid -29]

Pure water 840ml Particle calcium carbonate (mean particle diameter = about 0.03 micrometers) 257.4g kappa-carrageenan 1.62g Ethyl acrylate 18.4ml Surfactant -1 The weight ratio of the activity individual particle of each ink jet record form and a water-soluble binder and 1.2g of the void volume were as follows. Moreover, the same assessment as an example 1 was performed to each ink jet record form.

[0111]

[A table 3]

| インクジェット 記録用紙 | 固体微粒子 | 空隙容量 (ml/m ²) | 乾燥膜厚 (μm) | 空隙率 (%) | 比割れ | 備考 |
|-----------------|-----------------|------------------------------|--------------|------------|-----|-----|
| | 水溶性インク (重量比) | | | | | |
| 21 | 22.38 | 24 | 37 | 185 | ○ | 本発明 |
| 22 | 14.78 | (b) | 43(a) | (b) | ×× | 比較例 |
| 23 | 7 | 21 | 43 | 95 | ○ | 本発明 |
| 24 | 151.4 | 22 | 36.7 | 150 | ○ | 本発明 |
| 25 | 195 | 21.7 | 37.7 | 136 | ○ | 本発明 |
| 26 | 202.7 | 23 | 36.6 | 169 | ○ | 本発明 |
| 27 | 202.7 | (b) | 47.3 | (b) | ×× | 比較例 |
| 28 | 27.9 | 22.5 | 35 | 180 | ○ | 本発明 |
| 29 | 159 | 23.2 | 41.1 | 130 | ○ | 本発明 |

(b) : 評価できず

[0112]

[A table 4]

| 記録 用紙 | インク容量 | | インク 吸収性 | 乾燥性 | ドット直径 | | 光沢性 (%) | 色濃度 | 備考 |
|----------|-------|---|------------|-------|-------|-----|------------|------|-----|
| | ① | ② | | | K | K/Y | | | |
| 21 | ○ | ○ | 0.06 | 1分30秒 | 81 | 110 | 80 | 1.39 | 本発明 |
| 22 | △ | × | 0.19 | 6分 | 131 | 222 | 4 | 1.04 | 比較例 |
| 23 | ○ | ○ | 0.09 | 2分 | 83 | 108 | 84 | 1.37 | 本発明 |
| 24 | ○ | ○ | 0.06 | 1分30秒 | 82 | 109 | 83 | 1.40 | 本発明 |
| 25 | ○ | ○ | 0.06 | 1分30秒 | 82 | 108 | 82 | 1.39 | 本発明 |
| 26 | ○ | ○ | 0.06 | 2分 | 83 | 109 | 82 | 1.32 | 本発明 |
| 27 | △ | × | 0.20 | 4分 | 124 | 200 | 9 | 1.05 | 比較例 |
| 28 | ○ | ○ | 0.06 | 2分 | 81 | 110 | 84 | 1.32 | 本発明 |
| 29 | ○ | ○ | 0.06 | 2分 | 80 | 113 | 83 | 1.28 | 本発明 |

[0113] It turns out clearly from tables 3 and 4 like that the ink jet record form of this invention is excellent as compared with a comparative ink jet record form like an example 1.

[0114] the printing side side of the paper base material which performed rear-face processing like example 3 example 1 — simultaneous spreading was carried out, the following [coating liquid 3-1] was dried so that it might become 188 micrometers of humid thickness as a lower layer and might become 12 micrometers of humid thickness considering [coating liquid 3-2] as the upper layer, and the ink jet record form -30 was produced.

[0115]

[Coating liquid 3-1]

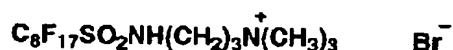
Pure water 935ml Particle silica with a mean particle diameter of about 0.07 micrometers 67.5g Polyvinyl alcohol of average degree of polymerization 3500 18g (whenever [saponification] 89%) Ethyl acetate 38.2ml Surfactant -1 1.2g [coating liquid 3-2]

Pure water 800ml Phenylcarbamoyl-ized gelatin 40g (the rate of an amino-group blockade = about 88%)

Polyvinyl pyrrolidone (K-90) 25g Polyethylene oxide (average molecular weight 100,000 [about]) 12g Surfactant -1 1.2g Surfactant -2 0.6g Hardening agent -1 (tetrakis vinyl sulfonylmethane) 2.1g

[0116]

[Formula 2]
界面活性剤-2



[0117] Ink jet record form - It is the same as the ink jet record form -30 except having performed humid thickness of 31: [coating liquid 3-2] by 8 micrometers.

[0118] Ink jet record form - It is the same as the ink jet record form -30 except having performed humid thickness of 32: [coating liquid 3-2] by 5 micrometers.

[0119] Ink jet record form - It is the same as the ink jet record form -30 except having changed the polyvinyl pyrrolidone of 33: [coating liquid 3-2] into polyvinyl alcohol (average degree of polymerization 500, whenever [saponification] 88%).

[0120] Ink jet record form - It is the same as the ink jet record form -30 except having changed the ethyl acetate of 34: [coating liquid 3-1] into H₂O.

[0121] the polyvinyl pyrrolidone of ink jet record form-35; [coating liquid 3-2] — Pao Genn (EP15) — the same as the ink jet record form -30 except having changed into the {first industrial incorporated company make}.

[0122] Ink jet record form - It is the same as the ink jet record form -30 except having changed 36: [coating liquid 3-1] into [coating liquid -21].

[0123] Ink jet record form - It is the same as the ink jet record form -30 except having changed 37; [coating liquid 3-1] into [coating liquid -22].

[0124] Ink jet record form - It is the same as the ink jet record form -30 except having used 25g for RAPONAITO RDS {the Japan silica industrial incorporated company make} instead of the polyvinyl pyrrolidone of 38; [coating liquid 3-2], and polyethylene oxide.

[0125] Ink jet record form - It is the same as the ink jet record form -30 except having changed 39; [coating liquid 3-1] into [coating liquid -23].

[0126] The same assessment as an example 1 was performed to each ink jet record form.

[0127]

[A table 5]

| インクジェット 記録用紙 | 乾燥膜厚 (μm) | ヒビ割れ | 備考 |
|-----------------|---------------------------|------|-----|
| 30 | 39.2 | ○ | 本発明 |
| 31 | 39.0 | ○ | 本発明 |
| 32 | 38.8 | ○ | 本発明 |
| 33 | 39.4 | ○ | 本発明 |
| 34 | 39.6 | △ | 比較例 |
| 35 | 39.3 | ○ | 本発明 |
| 36 | 40.5 | ○ | 本発明 |
| 37 | 46.2 | × | 比較例 |
| 38 | 38.7 | ○ | 本発明 |
| 39 | 48.2 | ○ | 本発明 |

[0128]

[A table 6]

| インクジェット 記録用紙 | インク容量 | | インク 吸収性 | 乾燥性 | ドット直径 | | 光沢度 (%) | 色濃度 | 備考 |
|-----------------|-------|---|------------|-------|-------|-----|------------|------|-----|
| | ① | ② | | | K | K/Y | | | |
| 30 | ○ | ○ | 0.06 | 2分 | 83 | 107 | 89 | 1.39 | 本発明 |
| 31 | ○ | ○ | 0.06 | 2分 | 82 | 111 | 87 | 1.39 | 本発明 |
| 32 | ○ | ○ | 0.06 | 2分 | 81 | 111 | 84 | 1.39 | 本発明 |
| 33 | ○ | ○ | 0.06 | 2分 | 82 | 114 | 89 | 1.37 | 本発明 |
| 34 | △ | × | 0.17 | 5分 | 90 | 120 | 22 | 1.07 | 比較例 |
| 35 | ○ | ○ | 0.06 | 2分 | 82 | 107 | 86 | 1.34 | 本発明 |
| 36 | ○ | ○ | 0.06 | 1分30秒 | 83 | 107 | 87 | 1.38 | 本発明 |
| 37 | △ | × | 0.15 | 6分 | 100 | 141 | 13 | 1.06 | 比較例 |
| 38 | ○ | ○ | 0.06 | 2分 | 80 | 97 | 92 | 1.40 | 本発明 |
| 39 | ○ | ○ | 0.09 | 2分 | 83 | 108 | 88 | 1.32 | 本発明 |

[0129] It turns out clearly from a table 5 and a table 6 like that the ink jet record form of this invention is excellent as compared with a comparative ink jet record form like an example 1.
[0130]

[Translation done.]

(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開平10-119420

(43) 公開日 平成10年(1998) 5月12日

(51) Int.Cl.⁸

識別記号

F I

B 4 1 M 5/00

B 4 1 M 5/00

B

B 3 2 B 27/00

B 3 2 B 27/00

Z

D 2 1 H 27/00

D 2 1 H 5/00

Z

審査請求 未請求 請求項の数 5 O L (全 12 頁)

(21) 出願番号

特願平8-282225

(22) 出願日

平成 8 年(1996) 10月24日

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(54) 【発明の名称】 インクジェット記録用紙

(57) 【要約】

【課題】 優れたインク吸収性、高画像濃度であるインクジェット記録用紙、さらに光沢が高く、微小ひび割れ発生が無い、インクジェット記録用紙の提供。

【解決手段】 支持体上に、少なくとも 1 層以上のインク受理層を設けてなるインクジェット記録用紙において、該インク受理層の少なくとも 1 層が固体微粒子と低沸点有機溶媒を少なくとも含有した液を塗布乾燥して形成されるインク空隙受理層であることを特徴とするインクジェット記録用紙。

【特許請求の範囲】

【請求項1】 支持体上に、少なくとも1層以上のインク受理層を設けてなるインクジェット記録用紙において、該インク受理層の少なくとも1層が固体微粒子と低沸点有機溶媒を少なくとも含有した液を塗布乾燥して形成されるインク空隙受理層であることを特徴とするインクジェット記録用紙。

【請求項2】 前記固体微粒子を含有する空隙受理層の空隙率が100容量%以上であることを特徴とする請求項1に記載のインクジェット記録用紙。

【請求項3】 前記インク空隙受理層の少なくとも1層に固体微粒子と親水性バインダーを含有し、該固体微粒子の該親水性バインダー1種に対する重量比が10以上、200未満であることを特徴とする請求項1又は2に記載のインクジェット記録用紙。

【請求項4】 前記インクジェット空隙受理層が、固体微粒子と親水性バインダーを少なくとも有し、該固体微粒子を親水性バインダー存在下で軟凝集させて得た液を塗布乾燥して形成される該インク空隙受理層であることを特徴とする請求項1、2又は3に記載のインクジェット記録用紙。

【請求項5】 支持体上に少なくとも1層以上のインク空隙受理層を設けてなるインクジェット記録用紙において、該支持体から最も遠い位置にある層が親水性バインダーを主体とし、空隙を有さないインク受理層（以下膨潤層と記す）であり、該膨潤層と該支持体との間に膨潤しなくかつ空隙を有するインク受理層を有することを特徴とする請求項1～4の何れか1項に記載のインクジェット記録用紙。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、水性インクを用いて記録を行うインクジェット記録用紙に関し、特にインク吸収性を改善したインクジェット記録用紙に関するものである。

【0002】

【従来の技術】インクジェット記録は、インクの微小液滴を種々の作動原理により飛翔させて紙などのインクジェット記録シートに付着させ、画像・文字などの記録を行うものであるが、比較的高速、低騒音、多色化が容易である等の利点を有している。この方式で従来から問題となっていたノズルの目詰まりとメンテナンスについては、インクおよび装置の両面から改良が進み、現在では各種プリンター、ファクシミリ、コンピューター端末等、さまざまな分野に急速に普及している。

【0003】このインクジェット記録方式で使用するインクジェット記録用紙としては、印字ドットの濃度が高く、色調が明るく鮮やかであること、インクの吸収が早く印字ドットが重なった場合に於いてもインクが流れ出したり滲んだりしないこと、印字ドットの横方向への

拡散が必要以上に大きくなく、かつ周辺が滑らかでばやけないこと等が要求される。

【0004】特にインク吸収速度が遅い場合には、2色以上のインク液滴が重なって記録される際に、インクジェット記録用紙上で液滴がハジキ現象を起こしてムラになったり、また、異なる色の境界領域でお互いの色が滲んだりして画質を大きく低下させやすいために、インクジェット記録用紙としては高いインク吸収性を持たせるようにすることが必要である。

10 【0005】これらの問題を解決するために、従来から非常に多くの技術が提案されている。

【0006】例えば、特開昭52-53012号に記載されている低サイズ原紙に表面加工用の塗料を潤湿させたインクジェット記録用紙、特開昭55-5830号に記載されている支持体表面にインク吸収性の塗層を設けたインクジェット記録用紙、特開昭56-157号に記載されている被履層中の顔料として非膠質シリカ粉末を含有するインクジェット記録用紙、特開昭57-107878号に記載されている無機顔料と有機顔料を併用したインクジェット記録用紙、特開昭58-110287号に記載されている2つの空孔分布ピークを有するインクジェット記録用紙、特開昭62-111782号に記載されている上下2層の多孔質層からなるインクジェット記録用紙、特開昭59-68292号、同59-123696号および同60-18383号などに記載されている不定形亀裂を有するインクジェット記録用紙、特開昭61-135786号、同61-148092号および同62-149475号等に記載されている微粉末層を有するインクジェット記録用紙、特開昭63-252779号、特開平1-108083号、同2-136279号、同3-65376号および同3-27976号等に記載されている特定の物性値を有する顔料や微粒子シリカを含有するインクジェット記録用紙、特開昭57-14091号、同60-219083号、同60-210984号、同61-20797号、同61-188183号、特開平5-278324号、同6-92011号、同6-183134号、同7-137431号、同7-276789号等に記載されているコロイド状シリカ等の微粒子シリカを含有するインクジェット記録用紙、および特開平2-276671号、同3-67684号、同3-215082号、同3-251488号、同4-67986号、同4-263983号および同5-16517号などに記載されているアルミナ水和物微粒子を含有するインクジェット記録用紙等が多数知られている。

【0007】しかし、インク受容層がインクを吸収したり保持するための空隙を多く有する層のみから構成される場合、空隙の多いインク受容層が空気との界面や皮膜表面のミクロな凹凸を多く有することになり、インク受容層への入射光が散乱されたり、透過が妨げられるため

に、光沢が出にくくなったり不透明になりやすい。

【0008】また、空隙を形成するため顔料自身の凹凸や顔料の2次凝集体の凹凸による皮膜表面の平滑性が低下して光沢が出にくい欠点がある。

【0009】更に、インク吸収容量をあげるため、空隙を増やす目的で空隙層の膜厚が増加する傾向であるが、空隙に浸透したインクに光が到達しにくくなるため画像が白っぽくなり、色再現性及び色濃度が低下する等の欠点を有する。

【0010】そのため、空隙層の空隙率を増やし、膜厚が薄い空隙層で空隙率をあげる検討も行われているが、顔料の分散性、塗布液粘度上昇、さらにはインク受理層の塗布、乾燥後のひび割れ等のさまざまな問題を有する。

【0011】従って、空隙の多いインク受容層で高い光沢性や透明性を維持しつつ、色再現性及び色濃度の高い画像を得るのは困難であった。

【0012】

【発明が解決しようとする課題】本発明は上記の実態に鑑みてなされたものであって、本発明の第1の目的は、優れたインク吸収性、高画像濃度であるインクジェット記録用紙を得ることであり、第2の目的は、さらに光沢が高く、微小ひび割れ発生が無い、インクジェット記録用紙を得ることにある。

【0013】

【課題を解決するための手段】本発明の上記目的は以下の構成により達成される。

【0014】1. 支持体上に、少なくとも1層以上のインク受理層を設けてなるインクジェット記録用紙において、該インク受理層の少なくとも1層が固体微粒子と低沸点有機溶媒を少なくとも含有した液を塗布乾燥して形成されるインク空隙受理層であることを特徴とするインクジェット記録用紙。

【0015】2. 前記固体微粒子を含有するインク空隙受理層の空隙率が100容量%以上であることを特徴とする前記1に記載のインクジェット記録用紙。

【0016】3. 前記インク空隙受理層の少なくとも1層に固体微粒子と親水性バインダーを含有し、該固体微粒子の該親水性バインダー1種に対する重量比が10以上、200未満であることを特徴とする前記1又は2に記載のインクジェット記録用紙。

【0017】4. 前記インク空隙受理層が、固体微粒子と親水性バインダーを少なくとも有し、該固体微粒子を親水性バインダー存在下で軟凝集させて得た液を塗布乾燥して形成されるインク空隙受理層であることを特徴とする前記1、2又は3に記載のインクジェット記録用紙。

【0018】5. 支持体上に少なくとも1層以上のインク受理層を設けてなるインクジェット記録用紙において、該支持体から最も遠い位置にある層が親水性バイン

ダーを主体とし、空隙を有さないインク受理層（以下膨潤層と記す）であり、該膨潤層と該支持体との間に空隙を有するインク受理層を有することを特徴とする前記1～4の何れか1項に記載のインクジェット記録用紙。

【0019】以下、本発明を詳細に説明する。

【0020】本発明のインクジェット記録用紙が有するインク空隙受理層（以下、単に空隙層ともいう）は、無機または有機の固体粒子とその間に形成される空隙から成る。

【0021】好ましい空隙の形成方法は以下の2種である。

【0022】（1）親水性バインダーに対して概ね等量以上（好ましくは1.0倍以上）の容積を有する固体微粒子及びまたは微粒子油滴と親水性バインダーを含有する塗布液を支持体上に塗布して固体微粒子の間に空隙を作成する方法、

（2）平均粒径が約0.1 μ m程度以下の固体微粒子を塗布液調整時または皮膜形成時に凝集させて2次粒子または3次元構造を形成して空隙を作成する方法、

上記空隙の大きさは好ましくは20～200Å、さらに好ましくは40～100Åであり、充填物の大きさや皮膜形成時の製造条件もこの様な空隙を形成する条件になるように設定するのが好ましい。

【0023】一方、上記（1）（2）の方法はインクジェット記録用紙を低コストで作成すると言う観点から複雑な製造工程を取らずに作成できる方法が好ましい。

【0024】本発明のインクジェット記録用紙の上記空隙層は皮膜としての特性を維持するためにバインダーを有していることが好ましい。

【0025】このバインダーとしては従来公知の各種のバインダーを使用することが出来るが、インクより高い浸透性が得られる親水性バインダーが好ましく用いられる。しかしながら、親水性バインダーの使用に当たっては、親水性バインダーが膨潤して、インクの初期の浸透時に膨潤して空隙を塞いでしまわないことが重要であり、この観点から比較的室温付近で膨潤性の低い親水性バインダーが好ましく用いられる。特に好ましい親水性バインダーは完全または部分ケン化のポリビニルアルコールまたはカチオン変成ポリビニルアルコールである。

【0026】ポリビニルアルコールの中でも特に好ましいのはケン化度が80以上の部分または完全ケン化したものである。また、皮膜脆弱性を改良する観点から、平均重合度は500～10000が好ましく、特に好ましくは1000～5000のものが用いられる。

【0027】また、カチオン変成ポリビニルアルコールとしては、例えば特開昭61-10483号に記載されているような、第1～3級アミノ基や第4級アンモニウム基を上記ポリビニルアルコールの主鎖または側鎖中に有するポリビニルアルコールである。

【0028】また、前記空隙層中には他の親水性バイン

ダーを含有させることが出来るが、好ましくはそれらの親水性バインダーは上記ポリビニルアルコールまたはカチオン変成ポリビニルアルコールに対して概ね20重量%以下であることが好ましい。

【0029】本発明のインクジェット記録用紙の空隙層を形成する場合において、特に好ましい態様である、前記(1)または(2)による空隙作成の場合、固体微粒子の親水性バインダーに対する容量比は3以上が好ましく、特に4以上にするのが好ましい。

【0030】本発明のインクジェット記録用紙の空隙層の空隙の容量はインクジェット記録用紙1m²当たり20ml/m²以上であることが好ましい。空隙容量が20ml/m²未満の場合、低インク量の吸収性は良好であるものの高いインク量の印字の際にインクが溢れて画質を低下させたり、あるいは印字後の乾燥性が遅いなどの問題が生じやすい。

【0031】一方、空隙容量の上限は特に制限されないが、空隙層の乾燥膜厚は概ね50μm以下にすることがひび割れ等の皮膜の物理的特性を悪化させないために必要であることから概ね40ml/m²以下である。

【0032】上記(1)の方法において、20ml/m²以上の空隙容量を達成するためには空隙層の空隙率を100容量%以上にすることが好ましい。

【0033】ここで空隙容量とは、空隙層中の乾燥膜厚から空隙層中のバインダーや各種の充填剤等の固相分の容量の総量を差し引いた値であり、空隙率はこれら固相分の容量に対する空隙量の割合を示す。

【0034】好ましくは空隙率を150容量%以上にするのがよい。空隙率の上限は、充填剤の種類やバインダーの種類により一般に変化するが、皮膜としての強度や脆弱性等から一般には200容量%以下である。

【0035】空隙率を好ましく100容量%以上とするためには、固体微粒子と親水性バインダーの比率が特に重要であり、該固体微粒子の親水性バインダーに対する重量比が10以上が好ましく、200未満にすることがより好ましい。この重量比が10未満では空隙容量が100%以上得るのが困難となり、200以上の場合には皮膜の脆弱性が劣化する。

【0036】空隙層が固体微粒子を含有する空隙層で有る場合、固体微粒子としては従来インクジェット記録用紙で公知の各種の無機または有機の固体微粒子を用いることが出来る。

【0037】上記目的で用いられる無機微粒子の例としては、軽質炭酸カルシウム、重質炭酸カルシウム、炭酸マグネシウム、カオリン、クレイ、タルク、硫酸カルシウム、硫酸バリウム、二酸化チタン、酸化亜鉛、水酸化亜鉛、硫化亜鉛、炭酸亜鉛、ハイドロタルサイト、珪酸アルミニウム、ケイソウ土、珪酸カルシウム、珪酸マグネシウム、合成非晶質シリカ、コロイダルシリカ、アルミナ、コロイダルアルミナ、擬ペーマイト、水酸化アル

ミニウム、リトポン、ゼオライト、水酸化マグネシウム等の白色無機顔料等を挙げることが出来る。

【0038】その様な無機微粒子は、1次粒子のままでも、また、2次凝集粒子を形成してバインダー中に分散された状態で添加されても良い。

【0039】一方有機微粒子の例としては、ポリスチレン、ポリアクリル酸エステル類、ポリメタクリル酸エステル類、ポリアクリルアミド類、ポリエチレン、ポリプロピレン、ポリ塩化ビニル、ポリ塩化ビニリデン、またはこれらの共重合体、尿素樹脂、またはメラミン樹脂等が挙げられる。

【0040】本発明においては高い濃度を達成し、鮮明な画像を記録し低コストで製造できる等の点より、固体微粒子として、アルミナ水和物微粒子、シリカ微粒子および炭酸カルシウムから選ばれる固体微粒子を用いることが好ましい。

【0041】本発明に好ましく用いられるアルミナまたはアルミナ水和物は、半径(短径)が3~10nmを有する細孔容積の和が0.2~2ml/gである多孔質アルミナまたはその含水物である。細孔容積の測定手段は、アルミナまたはアルミナ水和物の乾燥固相分に対して公知の窒素吸着法により測定することが出来る。

【0042】アルミナまたはアルミナ水和物は結晶性であっても、非晶質であっても良く、また、形状は不定形粒子、球状粒子、針状粒子など任意の形状の物を使用することが出来る。

【0043】本発明に好ましく使用されるシリカ系微粒子としては従来インクジェットで公知の各種のシリカ系微粒子を使用することが出来、例えば、湿式または気相法で合成された合成シリカ、コロイダルシリカ、1次粒子が凝集して2次粒子を形成している多孔質シリカ任意の形状のシリカを使用することが出来る。その様な例として、例えば特開昭55-51583号および同56-148583号等に記載された合成非晶質シリカ、例えば特開昭60-204390号に記載された気相法により合成されたシリカ超微粒子、特開昭60-222282号に記載されたフッ素を含有する合成不定形シリカ、特開昭60-224580号および同62-178384号に記載されたシランカップリング剤により表面処理された合成不定形シリカ、例えば特開昭62-183382号および同63-104878号に記載された球状シリカ、特開昭63-317381号に記載されたNa₂O含有量が0.5重量%以上である合成シリカ微粒子、特開平1-115677号に記載された比表面積が100m²/g以上の合成シリカ微粒子、特開昭62-286787号に記載されたアルミナ表面処理された合成シリカ微粒子、特開平1-259982号に記載されたCa、MgまたはBaで表面処理された合成シリカ微粒子、吸油量が180ml/g以上の合成シリカ微粒

子、特開昭57-14091号に記載されたコロイダルシリカ、特開昭60-219084号、特開平6-92011号、同6-297830号および同7-81214号に記載されたカチオン性コロイダルシリカ、および特開平5-278324号および同7-81214号に記載された数珠状に連結したまたは分岐したコロイダルシリカ等を挙げることが出来る。

【0044】しかしながら、高い光沢性と高い空隙容量を得るためには、平均粒径が7~30nmのシリカ超微粒子を用いることが好ましい。このシリカ微粒子は表面をカチオン変性されたものであってもよく、また、A

1、Ca、MgおよびBa等で処理された物であつてもよい。

【0045】本発明のインクジェット記録用紙に好ましく用いられる炭酸カルシウムとしては、例えば、特開昭57-12486号、同57-129778号、同58-55283号、同61-20792号に記載された特定に比表面積を有する軽質炭酸カルシウム、特開昭63-57277号および特開平4-250091号に記載された針柱状炭酸カルシウム、特開平3-251487号に記載された特定の針状1次粒子が凝集して2次粒子を形成した炭酸カルシウム微粒子、特開平4-250091号及び同4-260092号に記載された特定の吸油量を有する針柱状の斜方晶アルゴナイト炭酸カルシウム、および特開平7-40648号に記載された球状沈降性炭酸カルシウム等が挙げられる。

【0046】この場合、高い光沢性と高い空隙容量を得られることから、粒径が約0.1μm以下の炭酸カルシウム微粒子を使用することが好ましく、特に平均粒径が10~50nmの炭酸カルシウム微粒子を使用することが好ましい。

【0047】一方、前記(2)による空隙形成を行う場合、固体微粒子と親水性バインダーは比較的強い相互作用をし、軟凝集体を形成することが好ましい。その様な固体微粒子と親水性バインダーは前記した中から適宜選択し、例えばそれらの水溶液を水分散物と混合し、その粘度上昇から比較的容易に判断することができる。

【0048】好ましい形態は親水性バインダーの水溶液[A](通常1~20重量%)と、固体微粒子分散液[B](通常1~30重量%)を混合し、得られた混合液の粘度が[A]または[B]の高い方の少なくとも1.5倍以上になる様なものが使用できる。

【0049】本発明で特に好ましいのは、親水性バインダーとして少なくとも水酸基を有するポリマーであり、ポリビニルアルコール、カチオン性ポリビニルアルコールは特に好ましい。

【0050】又、固体微粒子としては、平均粒径が0.005~0.1μmの微粒子シリカ、ケイ酸マグネシウムが特に好ましい。

【0051】本発明の低沸点有機溶媒は、塗布乾燥時に

蒸発し残存していないものが好ましく、好ましくは沸点が130℃以下、特に好ましくは100℃以下、最も好ましくは80℃以下の有機溶媒である。又、室温における水に対する溶解度が1重量%以上の低沸点有機溶媒が好ましい。

【0052】低沸点有機溶媒の具体例として例えば、メタノール、エタノール、イソプロパノール、n-プロパノール、n-ブタノール、2-メトキシエタノール、アセトン、メチルエチルケトン、2-ヘキサノン、酢酸エチル、酢酸ビニル、酢酸イソプロピル、酢酸n-プロピル、酢酸n-ブチル、ギ酸エチル、ギ酸プロピル、酪酸エチル、酪酸ビニル、酪酸メチル、アクリル酸メチル、テトラヒドロフラン、アセトニトリル、1,2-ジメトキシエタン、イソプロピルビニルエーテル、および1,4-ジオキサン等が挙げられる。これらは2種以上を併用してもよい。

【0053】この様な低沸点有機溶媒は好ましくは親水性バインダーに対して1~15重量%用いることが好ましい。

【0054】上記低沸点有機溶媒を含有する塗布液を調製する際には、該低沸点有機溶媒の濃度は固体微粒子の濃度、親水性バインダーの種類及び濃度等に様々変化するが、一般的には塗布液中における濃度が0.1~15重量%、好ましくは0.5~10重量%である。

【0055】又有機溶媒の添加時期は塗布前であれば、塗布液調製時のいかなる時期でも良く、具体的には例えば固体微粒子の分散時、親水性バインダー溶液との混合時、或いは塗布直前、のいかなる時期であっても良い。

【0056】本発明の低沸点有機溶媒を塗布液中に添加することにより、前記(1)の方法による空隙形成の場合には、固体微粒子の凝集による粗大粒子の形成が抑制され、高い光沢を有する塗膜が得られると共に空隙容量が増してインク吸収性が改善される。

【0057】又、前記(2)の方法においては、一般に固体微粒子と親水性バインダーの相互作用が比較強いために塗布液が一般に増粘しやすく、作業性や塗布性及び生産性が低下しやすい。この場合、本発明の低沸点有機溶媒を添加することにより塗布液粘度が減粘して作業性、塗布性及び生産性が向上する。又塗布液乾燥後には有機溶媒の蒸発により急激に塗膜温度の低下と有機溶媒自体の蒸発による塗布液の急激な増粘により強い乾燥風を吹き付けることが可能となつて、塗布スピードも大きく増大させることができる。

【0058】本発明のインクジェット記録用紙のインク空隙受理層側の任意の層中には、必要に応じて各種の添加剤を含有させることが出来る。

【0059】例えば、特開昭57-74193号、同57-87988号及び同62-261476号に記載の紫外線吸収剤、特開昭57-74192号、同57-87989号、同60-72785号、同61-1465

91号、特開平1-95091号及び同3-13376号等に記載されている退色防止剤、アニオン、カチオンまたはノニオンの各種界面活性剤、特開昭59-42993号、同59-52689号、同62-280069号、同61-242871号および特開平4-219266号等に記載されている蛍光増白剤、硫酸、リン酸、クエン酸、水酸化ナトリウム、水酸化カリウム、炭酸カリウム等のpH調整剤、消泡剤、ジエチレングリコール等の潤滑剤、防腐剤、増粘剤、硬膜剤、帯電防止剤、マツト剤等の公知の各種添加剤を含有させることもできる。

【0060】硬膜剤としては無機または有機の硬膜剤を使用することが出来、例えばクロムみょうばん、ホルムアルデヒド、グリオキサール、エポキシ系化合物、ビニルスルホン系化合物、アクリロイル系化合物、s-トリアジン系化合物、N-メチロール系化合物、カルボジイミド系化合物およびエチレンイミノ系化合物等を使用することが出来る。

【0061】本発明のインクジェット記録用紙におけるインク記録面側の塗布固形分の量は特に制限はないが、概ねインクジェット記録用紙に対して5~60g/m²が好ましく、10~40g/m²がより好ましい。なお、記録画像形成後のカールの防止という面からは、なるべく薄く形成するのが良い。

【0062】本発明のインク記録面側の任意の構成層中には、画像の耐水化剤として特開昭56-84992号のポリカチオン高分子電解質、特開昭57-36692号の塩基性ラテックスポリマー、特公平4-15744号、特開昭61-58788号、同62-174184号等記載のポリアリルアミン、特開昭61-47290号記載のアルカリ金属弱酸塩等を一種以上用いることができる。

【0063】本発明でインクジェット記録用紙の支持体としては、従来インクジェット用記録用紙として公知のものを適宜使用できる。

【0064】透明支持体としては、例えば、ポリエステル系樹脂、ジアセテート系樹脂、トリアセテート系樹脂、アクリル系樹脂、ポリカーボネート系樹脂、ポリ塩化ビニル系樹脂、ポリイミド系樹脂、セロハン、セルロイド等の材料からなるフィルムや板、およびガラス板などを挙げられ、この中でもOHPとして使用されたときの輻射熱に耐える性質のものが好ましく、ポリエチレンテレフタレートが特に好ましい。このような透明な支持体の厚さとしては、約10~200μmが好ましい。透明支持体のインク空隙受理層側およびバック層側には公知の下引き層を設けることが、インク空隙受理層やバック層と支持体の接着性の観点から好ましい。

【0065】また、透明である必要のない場合に用いる支持体としては、例えば、一般の紙、合成紙、樹脂被覆紙、布、木材、金属等からなるシートや板、および上記

の透光性支持体を公知の手段により不透明化処理したもの等を挙げることができる。不透明の支持体としては、基紙の少なくとも一方に白色顔料等を添加したポリオレフィン樹脂被覆層を有する樹脂被覆紙（いわゆるRCペーパー）、ポリエチレンテレフタレートに白色顔料を添加してなるいわゆるホワイトペットが好ましい。

【0066】上記支持体とインク空隙受理層の接着強度を大きくする等の目的で、インク空隙受理層の塗布に先立って、支持体にコロナ放電処理や下引処理等を行うことが好ましい。さらに、本発明の記録シートは必ずしも無色である必要はなく、着色された記録シートであつてもよい。

【0067】本発明のインクジェット記録用紙では紙支持体の両面をポリエチレンでラミネートした紙支持体を用いることが、記録画像が写真画質に近く、しかも低コストで高品質の画像が得られるために特に好ましい。そのようなポリエチレンでラミネートした紙支持体について以下に説明する。

【0068】紙支持体に用いられる原紙は木材パルプを主原料とし、必要に応じて木材パルプに加えてポリプロピレンなどの合成パルプあるいはナイロンやポリエステルなどの合成繊維を用いて抄紙される。木材パルプとしてはLBKP、LBSP、NBKP、NBSP、LDP、NDP、LUKP、NUKPのいずれも用いることが出来るが短繊維分の多いLBKP、NBSP、LBSP、NDP、LDPをより多く用いることが好ましい。但し、LBSPおよびまたはLDPの比率は10重量%以上、70重量%以下が好ましい。

【0069】上記パルプは不純物の少ない化学パルプ（硫酸塩パルプや亜硫酸塩パルプ）が好ましく用いられ、又、漂白処理を行って白色度を向上させたパルプも有用である。

【0070】原紙中には、高級脂肪酸、アルキルケテンダイマー等のサイズ剤、炭酸カルシウム、タルク、酸化チタンなどの白色顔料、スターチ、ポリアクリルアミド、ポリビニルアルコール等の紙力増強剤、蛍光増白剤、ポリエチレングリコール類等の水分保持剤、分散剤、4級アンモニウム等の柔軟化剤などを適宜添加することが出来る。

【0071】抄紙に使用するパルプの濾水度はCSFの規定で200~500ccが好ましく、また、叩解後の繊維長がJIS-P-8207に規定される24メッシュ残分重量%と42メッシュ算分の重量%との和が30乃至70%が好ましい。なお、4メッシュ残分の重量%は20重量%以下であることが好ましい。

【0072】原紙の坪量は30乃至250gが好ましく、特に50乃至200gが好ましい。原紙の厚さは40乃至250μmが好ましい。

【0073】原紙は抄紙段階または抄紙後にカレンダー処理して高平滑性を与えることも出来る。原紙密度は

0.7乃至1.2 g/m² (JIS-P-8118) が一般的である。更に原紙剛度はJIS-P-8143に規定される条件で20乃至200 gが好ましい。

【0074】原紙表面には表面サイズ剤を塗布しても良く、表面サイズ剤としては前記原紙中添加できるサイズと同様のサイズ剤を使用できる。

【0075】原紙のpHはJIS-P-8113で規定された熱水抽出法により測定された場合、5～9であることが好ましい。

【0076】原紙表面および裏面を被覆するポリエチレンは、主として低密度のポリエチレン(LDPE)および/または高密度のポリエチレン(HDPE)であるが他のLLDPEやポリプロピレン等も一部使用することが出来る。

【0077】特にインク空隙受理層側のポリエチレン層は写真用印画紙で広く行われているようにルチルまたはアナターゼ型の酸化チタンをポリエチレン中に添加し、不透明度および白色度を改良したものが好ましい。酸化チタン含有量はポリエチレンに対して概ね3～20重量%、好ましくは4～13重量%である。

【0078】ポリエチレン被覆紙は光沢紙として用いることも、また、ポリエチレンを原紙表面上に熔融押し出してコーティングする際にいわゆる型付け処理を行って通常の写真印画紙で得られるようなマット面や絹目面を形成した物も本発明で使用できる。

【0079】原紙の表裏のポリエチレンの使用量はインク空隙受理層やバック層を設けた後で低湿および高湿化でのカールを最適化するように選択されるが、概ねインク受容層側のポリエチレン層が20～40 μm、バック層側が10～30 μmの範囲である。

〔塗布液1-1〕

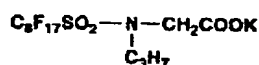
| | |
|-----------------------------------|---------|
| 純水 | 935 ml |
| 平均粒径約0.07 μmの微粒子シリカ | 67.5 g |
| 平均重合度3500のポリビニルアルコール (ケン化度89%) | 18 g |
| 酢酸エチル | 38.2 ml |
| 界面活性剤-1 | 1.2 g |

この皮膜の空隙容量は23 ml/m²であった。

【0085】

〔化1〕

界面活性剤-1



【0086】次に、インクジェット記録用紙-1において

〔塗布液1-2〕

| | |
|-----------------------------------|--------|
| 純水 | 980 ml |
| 平均粒径約0.07 μmの微粒子シリカ | 48.2 g |
| 平均重合度3500のポリビニルアルコール (ケン化度89%) | 12.8 g |

【0080】更に上記ポリエチレン被覆紙支持体は以下の特性を有していることが好ましい。

【0081】①引っ張り強さ：JIS-P-8113で規定される強度で縦方向が2乃至30 kg、横方向が1乃至20 kgであることが好ましい、

②引き裂き強度：JIS-P-8116による規定方法で縦方向が10乃至200 g、横方向が20乃至200 gが好ましい、

③圧縮弾性率 $\geq 10^3$ kgf/cm²

④表面ベック平滑度：JIS-P-8119に規定される条件で20秒以上、特に好ましくは500秒以上が光沢面としては好ましいが、いわゆる型付け品ではこれ以下であっても良い、

⑤不透明度：JIS-P-8119による方法で85%以上、特に90%以上が好ましい。

【0082】

【実施例】以下に本発明の実施例を挙げて説明するが、本発明はこれらの例に限定されるものではない。なお、実施例中で「%」は特に断りのない限り絶乾重量%を示す。

【0083】実施例1

100 g/m²の原紙両面をポリエチレンで被覆した紙支持体(厚さ140 μm、記録面側のポリエチレン層中に7重量%のアナターゼ型二酸化チタン含有。記録面の裏面側にバック層としてアルカリ処理ゼラチン1.2 g/m²と硬膜剤を含有する層を有する)上の記録面に、下記の〔塗布液1-1〕を湿潤膜厚が188 μmに成るように塗布し、乾燥し空隙を有する層を支持体上に塗設しインクジェット記録用紙-1を得た。

【0084】

て、〔塗布液1-1〕を用いた塗布を以下のように変更したインクジェット記録用紙-2～7をインクジェット記録用紙-1と同様にして作成した。

【0087】インクジェット記録用紙-2：〔塗布液1-1〕の酢酸エチルを純水に変えた以外はインクジェット記録用紙-1と同じ。

【0088】インクジェット記録用紙-3：

界面活性剤-1

上記塗布液を湿潤膜厚が $125\mu\text{m}$ に成るように塗布し乾燥後に更に上記塗布液で再度塗布乾燥して空隙を有する層を支持体上に塗設した。

【0089】インクジェット記録用紙-4

上記の塗布液〔塗布液1-1〕の酢酸エチルの量を $18\text{ml}/\text{m}^2$ に低減し、純水量を 10.2ml 増加した以外はインクジェット記録用紙-1と同じ。

【0090】インクジェット記録用紙-5：〔塗布液1-1〕の酢酸エチルをイソプロパノールに変えた以外はインクジェット記録用紙-1と同じ。

【0091】インクジェット記録用紙-6：〔塗布液1-1〕の酢酸エチルをアセトンに変えた以外はインクジェット記録用紙-1と同じ。

【0092】インクジェット記録用紙-7：〔塗布液1-1〕の酢酸エチルをメチルエチルケトンに変えた以外はインクジェット記録用紙-1と同じ。

【0093】得られた各々のインクジェット記録用紙について、セイコーエプソン株式会社製インクジェットプリンターMJ-5100Cを用い、評価パターンを印字し以下の項目の評価を行った。

【0094】(1) インク吸収容量：

①イエローとシアン各インクの最大インク量の60%の吐出時、

②イエローとシアン各インクの最大インク量の60%の吐出とマゼンタインクの最大インク量の30%を吐出させた時、

各々の場合のインクの溢れの状態を目視で観察した。

【0095】〔インクの溢れ〕

○：印字直後に全く溢れない

△：印字直後には僅かに溢れているが約10秒以内に乾燥する

×：印字直後に溢れており表面が乾燥するのに10秒以上かかる。

【0096】(2) インク吸収性：

①イエローおよびシアンのそれぞれ最大インク量の30%になるように均一に吐出させて記録し、ベタ部の赤色反射濃度をマイクロデンシトメーター（アパーチャ

1. 2g

$=200\mu\text{m}\phi$)を用いて20点測定し、その濃度のバラツキの標準偏差を求め平均反射濃度で割った値を求めた。

【0097】インク吸収性が良好な場合には画像にムラが無くこの値が小さくなるが、インク吸収性が低下するとこのお互いのインク液滴同士が記録紙上で互いにビーディングを起こしてムラになりこの値が増加する。

【0098】(3) 乾燥性：イエローとマゼンタの60%印字部を印字後一定時間経過後、普通紙を重ねて放置し、インクが普通紙に転写しなくなるまでの時間を求めた、

(4) ドット直径：ブラックインクの単一ドット直径(K)およびイエローベタ印字部にブラックの単一ドットを印字しその直径を顕微鏡で観察して求めた(K/Y)。直径は、それぞれ20個のドットの面積を測定しこれを円換算したときの直径の平均値として求めた(単位： μm)

(5) 光沢度：印字面を日本電色工業株式会社製変角光沢度計(VGS-1001DP)を用いて60度光沢を測定した。

【0099】(6) 塗膜の微小ひび割れ：塗膜のひび割れはシアン印字部について50倍の倍率で顕微鏡写真を撮影し、この写真を用いて目視で評価した。

【0100】評価基準は、

○：ひび割れの発生なし

△：ひび割れの発生がわずかにある

×：ひび割れがかなり認められる

××：拡大しなくても視認できる

(7) 印字濃度：ブラックインクを印字して、印字濃度を光学濃度で測定した。

【0101】数値の高い方が印字濃度は高いことを示す。

【0102】各々のインクジェット記録用紙の空隙容量等は以下の通りであった。

【0103】

【表1】

| インクジェット 記録用紙 | 湿潤膜厚 (μm) | 乾燥膜厚 (μm) | 空隙容量 (ml/m^2) | 空隙率 (%) | 備考 |
|-----------------|---------------------------|---------------------------|------------------------------------|------------|-----|
| 1 | 188 | 38.4 | 23 | 149 | 本発明 |
| 2 | 188 | 37(a) | 16 | 76 | 比較例 |
| 3 | 125×2 | 52 | 23 | 79 | 比較例 |
| 4 | 188 | 36.4 | 20 | 122 | 本発明 |
| 5 | 188 | 42 | 20.3 | 91 | 本発明 |
| 6 | 188 | 37.4 | 22.6 | 152 | 本発明 |
| 7 | 188 | 38.4 | 22.5 | 141 | 本発明 |

(a)；塗布表面の凹凸が激しく真の膜厚ではない

| 記録 用紙 | インク容量 | | インク 吸収性 | 乾燥性 (分) | ドット直径 | | 光沢度 (%) | ヒビ割れ | 色濃度 | 備考 |
|----------|-------|---|------------|------------|-------|-----|------------|------|------|-----|
| | ① | ② | | | K | K/Y | | | | |
| 1 | ○ | ○ | 0.06 | 2 | 82 | 109 | 84 | ○ | 1.39 | 本発明 |
| 2 | △ | × | 0.18 | 5 | 120 | 210 | 8 | × | 1.03 | 比較例 |
| 3 | ○ | ○ | 0.08 | 2 | 90 | 122 | 76 | ○ | 1.09 | 比較例 |
| 4 | ○ | ○ | 0.07 | 2 | 80 | 113 | 82 | ○ | 1.38 | 本発明 |
| 5 | ○ | ○ | 0.09 | 2 | 83 | 110 | 83 | ○ | 1.36 | 本発明 |
| 6 | ○ | ○ | 0.06 | 2 | 82 | 109 | 82 | ○ | 1.39 | 本発明 |
| 7 | ○ | ○ | 0.06 | 2 | 81 | 109 | 82 | ○ | 1.37 | 本発明 |

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【0105】表2の結果から、本発明のインクジェット記録用紙-1、4～7は高いインク吸収容量、良好なインク吸収性と乾燥性並びに高光沢性を有し、かつ、微小ひび割れの発生が無く、印字濃度が高くさらにドットサイズが小さく高品位インクジェット記録に適していることがわかる。

【0106】実施例2

〔塗布液-21〕

| | |
|-----------------------------------|--------|
| 純水 | 837ml |
| 微粒子炭酸カルシウム（平均粒径＝約0.03μm） | 257.4g |
| 平均重合度3200のポリビニルアルコール （ケン化度85%） | 11.5g |
| 酢酸エチル | 35.3ml |
| 界面活性剤-1 | 1.2g |

以下、塗布液-21を22～29に変えてインクジェット記録用紙-21と同様に塗布液-22～29を塗布してインクジェット記録用紙-22～29を作成した。

〔塗布液-22〕

| | |
|-----------------------------------|-------|
| 純水 | 870ml |
| 微粒子炭酸カルシウム（平均粒径＝約0.03μm） | 170g |
| 平均重合度3200のポリビニルアルコール （ケン化度85%） | 11.5g |
| 界面活性剤-1 | 1.2g |

〔塗布液-23〕

| | |
|-----------------------------------|-------|
| 純水 | 905ml |
| 微粒子炭酸カルシウム（平均粒径＝約0.03μm） | 80.5g |
| 平均重合度3200のポリビニルアルコール （ケン化度85%） | 11.5g |

| | |
|---------|--------|
| 酢酸エチル | 33.2ml |
| 界面活性剤-1 | 1.2g |

〔塗布液-24〕

| | |
|-----------------------------------|--------|
| 純水 | 846ml |
| 微粒子炭酸カルシウム（平均粒径＝約0.03μm） | 257.4g |
| 平均重合度3200のポリビニルアルコール （ケン化度85%） | 1.7g |

| | |
|---------|--------|
| 酢酸エチル | 20.5ml |
| 界面活性剤-1 | 1.2g |

〔塗布液-25〕

| | |
|--------------------------|--------|
| 純水 | 847ml |
| 微粒子炭酸カルシウム（平均粒径＝約0.03μm） | 257.4g |

実施例1において、〔塗布液1-1〕を以下の〔塗布液-21〕に変更した以外は実施例1と同様にしてインクジェット記録用紙-21を作成した。

【0107】実施例1と同様に裏面処理を施した紙支持体の印字面側に湿潤膜厚が235μmとなるように下記の塗布液-21を使用して塗布して乾燥を行った。

【0108】

【0109】なお、評価を実施例1と同様に行った。

【0110】

| 17 | 18 |
|---|--------------|
| 平均重合度3200のポリビニルアルコール (ケン化度85%) | 1.32g 195 |
| アセトン | 42ml |
| 界面活性剤-1 | 1.2g |
| [塗布液-26] | |
| 純水 | 847ml |
| 微粒子炭酸カルシウム (平均粒径=約0.03 μ m) | 257.4g |
| 平均重合度3200のポリビニルアルコール (ケン化度85%) | 1.27g |
| 界面活性剤-1 | 1.2g |
| [塗布液-27] | |
| 純水 | 902ml |
| 微粒子表面脂肪酸処理炭酸カルシウム (平均粒径=約0.05 μ m) | 257.4g |
| 平均重合度3200のポリビニルアルコール (ケン化度85%) | 1.27g |
| 界面活性剤-1 | 1.2g |
| [塗布液-28] | |
| 純水 | 837ml |
| 微粒子炭酸カルシウム (平均粒径=約0.03 μ m) | 332.4g |
| 平均重合度1700のポリビニルアルコール (ケン化度80%) | 11.9g |
| n-プロピルアルコール | 35.2ml |
| 界面活性剤-1 | 1.2g |
| [塗布液-29] | |
| 純水 | 840ml |
| 微粒子炭酸カルシウム (平均粒径=約0.03 μ m) | 257.4g |
| κ -カラギナン | 1.62g |
| アクリル酸エチル | 18.4ml |
| 界面活性剤-1 | 1.2g |

各々のインクジェット記録用紙の使用個体微粒子と水溶性バインダーの重量比、空隙容量は以下の通りであった。又、各々のインクジェット記録用紙に対して実施例

1と同様な評価を行った。

【0111】

【表3】

| インクジェット 記録用紙 | 固体微粒子 水溶性バインダー (重量比) | 空隙容量 (ml/m ²) | 乾燥膜厚 (μ m) | 空隙率 (%) | 比割れ | 備考 |
|-----------------|----------------------------|------------------------------|--------------------|------------|-----|-----|
| 21 | 22.38 | 24 | 37 | 185 | ○ | 本発明 |
| 22 | 14.78 | (b) | 43(a) | (b) | ×× | 比較例 |
| 23 | 7 | 21 | 43 | 95 | ○ | 本発明 |
| 24 | 151.4 | 22 | 36.7 | 150 | ○ | 本発明 |
| 25 | 195 | 21.7 | 37.7 | 136 | ○ | 本発明 |
| 26 | 202.7 | 23 | 36.6 | 169 | ○ | 本発明 |
| 27 | 202.7 | (b) | 47.3 | (b) | ×× | 比較例 |
| 28 | 27.9 | 22.5 | 35 | 180 | ○ | 本発明 |
| 29 | 159 | 23.2 | 41.1 | 130 | ○ | 本発明 |

(b) : 評価できず

【0112】

【表4】

| 記録 用紙 | インク容量 | | インク 吸収性 | 乾燥性 | ドット直径 | | 光沢性 (%) | 色濃度 | 備考 |
|----------|-------|---|------------|-------|-------|-----|------------|------|-----|
| | ① | ② | | | K | K/Y | | | |
| 21 | ○ | ○ | 0.06 | 1分30秒 | 81 | 110 | 80 | 1.39 | 本発明 |
| 22 | △ | × | 0.19 | 6分 | 131 | 222 | 4 | 1.04 | 比較例 |
| 23 | ○ | ○ | 0.09 | 2分 | 83 | 108 | 84 | 1.37 | 本発明 |
| 24 | ○ | ○ | 0.06 | 1分30秒 | 82 | 109 | 83 | 1.40 | 本発明 |
| 25 | ○ | ○ | 0.06 | 1分30秒 | 82 | 108 | 82 | 1.39 | 本発明 |
| 26 | ○ | ○ | 0.06 | 2分 | 83 | 109 | 82 | 1.32 | 本発明 |
| 27 | △ | × | 0.20 | 4分 | 124 | 200 | 9 | 1.05 | 比較例 |
| 28 | ○ | ○ | 0.06 | 2分 | 81 | 110 | 84 | 1.32 | 本発明 |
| 29 | ○ | ○ | 0.06 | 2分 | 80 | 113 | 83 | 1.28 | 本発明 |

【0113】表3、4から明らかのように、実施例1と同様、本発明のインクジェット記録用紙が比較のインクジェット記録用紙に比して優れていることが分かる。

【0114】実施例3

実施例1と同様に裏面処理を施した紙支持体の印字面側

〔塗布液3-1〕

純水

935ml

平均粒径約0.07 μ mの微粒子シリカ

67.5g

平均重合度3500のポリビニルアルコール

18g

(ケン化度89%)

酢酸エチル

38.2ml

界面活性剤-1

1.2g

〔塗布液3-2〕

純水

800ml

フェニルカルバモイル化ゼラチン

40g

(アミノ基封鎖率=約88%)

ポリビニルピロリドン(K-90)

25g

ポリエチレンオキサイド(平均分子量約10万)

12g

界面活性剤-1

1.2g

界面活性剤-2

0.6g

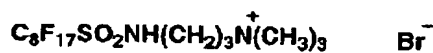
硬膜剤-1(テトラキスビニルスルホニルメタン)

2.1g

【0116】

【化2】

界面活性剤-2



【0117】インクジェット記録用紙-31：〔塗布液3-2〕の湿潤膜厚を8 μ mで行った以外はインクジェット記録用紙-30と同じ。

【0118】インクジェット記録用紙-32：〔塗布液3-2〕の湿潤膜厚を5 μ mで行った以外はインクジェット記録用紙-30と同じ。

【0119】インクジェット記録用紙-33：〔塗布液3-2〕のポリビニルピロリドンにポリビニルアルコール(平均重合度500、ケン化度88%)に変えた以外はインクジェット記録用紙-30と同じ。

【0120】インクジェット記録用紙-34：〔塗布液

に、下記の〔塗布液3-1〕を下層として湿潤膜厚18 μ mに、〔塗布液3-2〕を上層として湿潤膜厚12 μ mになるように同時塗布して乾燥し、インクジェット記録用紙-30を作製した。

【0115】

3-1〕の酢酸エチルをH₂Oに変えた以外はインクジェット記録用紙-30と同じ。

【0121】インクジェット記録用紙-35：〔塗布液3-2〕のポリビニルピロリドンにパオゲン(EP15)〔第一工業株式会社製〕に変えた以外はインクジェット記録用紙-30と同じ。

【0122】インクジェット記録用紙-36：〔塗布液3-1〕を〔塗布液-21〕に変えた以外はインクジェット記録用紙-30と同じ。

【0123】インクジェット記録用紙-37：〔塗布液3-1〕を〔塗布液-22〕に変えた以外はインクジェット記録用紙-30と同じ。

【0124】インクジェット記録用紙-38：〔塗布液3-2〕のポリビニルピロリドン、ポリエチレンオキサイドのかわりにラポナイトRDS〔日本シリカ工業株式会社製〕を25gを使用した以外はインクジェット記録用紙-30と同じ。

【0125】インクジェット記録用紙-39：〔塗布液

3-1]を〔塗布液-23〕に変えた以外はインクジェット記録用紙-30と同じ。

【0126】各々のインクジェット記録用紙に対して実施例1と同様な評価を行った。

【0127】

【表5】

| インクジェット 記録用紙 | 乾燥膜厚 (μm) | ヒビ割れ | 備考 |
|-----------------|---------------------------|------|-----|
| 30 | 39.2 | ○ | 本発明 |
| 31 | 39.0 | ○ | 本発明 |
| 32 | 38.8 | ○ | 本発明 |
| 33 | 39.4 | ○ | 本発明 |
| 34 | 39.6 | △ | 比較例 |
| 35 | 39.3 | ○ | 本発明 |
| 36 | 40.5 | ○ | 本発明 |
| 37 | 46.2 | × | 比較例 |
| 38 | 38.7 | ○ | 本発明 |
| 39 | 48.2 | ○ | 本発明 |

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【0128】

【表6】

| インクジェット 記録用紙 | インク容量 | | インク 吸収性 | 乾燥性 | ドット直径 | | 光沢度 (%) | 色濃度 | 備考 |
|-----------------|-------|---|------------|-------|-------|-----|------------|------|-----|
| | ① | ② | | | K | K/Y | | | |
| 30 | ○ | ○ | 0.06 | 2分 | 83 | 107 | 89 | 1.39 | 本発明 |
| 31 | ○ | ○ | 0.06 | 2分 | 82 | 111 | 87 | 1.39 | 本発明 |
| 32 | ○ | ○ | 0.06 | 2分 | 81 | 111 | 84 | 1.38 | 本発明 |
| 33 | ○ | ○ | 0.06 | 2分 | 82 | 114 | 89 | 1.37 | 本発明 |
| 34 | △ | × | 0.17 | 5分 | 90 | 120 | 22 | 1.07 | 比較例 |
| 35 | ○ | ○ | 0.06 | 2分 | 82 | 107 | 86 | 1.34 | 本発明 |
| 36 | ○ | ○ | 0.06 | 1分30秒 | 83 | 107 | 87 | 1.38 | 本発明 |
| 37 | △ | × | 0.15 | 6分 | 100 | 141 | 13 | 1.06 | 比較例 |
| 38 | ○ | ○ | 0.06 | 2分 | 80 | 97 | 92 | 1.40 | 本発明 |
| 39 | ○ | ○ | 0.09 | 2分 | 83 | 108 | 88 | 1.32 | 本発明 |

【0129】表5、表6から明らかなように、実施例1と同様、本発明のインクジェット記録用紙が比較のインクジェット記録用紙に比して優れていることが分かる。

【0130】

【発明の効果】以上実施例で実証した如く、本発明によるインクジェット記録用紙は優れたインク吸収性、高画像濃度であり、さらに光沢が高く、微小ひび割れ発生が無い優れた効果を有す。